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The Importance of the Acute and Subacute Interdisciplinary Management of a Patient with Conus Medullaris Syndrome: Case Report

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Abstract: *Background*: One of the main components in spinal cord injury´s management lies in the early and adequate interventions, as well as the possible outcomes considering the time from the trauma to every step afterwards. This case reports the course of action taken in an adult previously healthy that was diagnosed with conus medullaris syndrome because of falling from a considerable height. Intraoperative Monitoring can help us to look after the early changes that may occur in surgical correction and allows giving prognostic value to neurophysiological changes that will affect the patient's quality of life. Diagnostic images are also essential for a proper surgical approach, and an adequate follow-up of the patient. All these tools facilitate the rehabilitation treatment, in whom our final objective will be to achieve the best global functionality. *Objective*: Based on a case, we seek to describe the importance of the acute and subacute interdisciplinary management of a patient with Conus Medullaris Syndrome. *Methods*: Case report, the information was extracted from the medical history. *Results*: The result was positive due to the fast and adequate response given from a first level health center to the operation room and the rehabilitation phase. *Conclusion*: An adequate interdisciplinary conduct approaches each individual with specific and realistic objectives, with continuous assessments and always considering the possible progressions and/or variations of the patient's state. Explaining the complications inherent to the surgical and non-surgical component, for an optimal result according to the conditions and resources available.

Keywords: Cauda Equina, Conus Medullaris Syndrome, Traumatic Spinal Cord Injury, Electrodiagnostic

1. Introduction

The adequate care of a spinal cord trauma lies in the management and in the interventions planned from the first response given by the health care personal, taking into account the type of trauma, the time, and the damage´s extension to adjacent structures and components of the spinal cord and possible outcomes inherent to the involvement of spinal cord in traumatic injuries [1, 2]. Conus medullaris syndrome has a low frequency, with an estimated prevalence of 1 in 30,000 to 100,000 people per year, however, it has a high impact in the health system [1, 3].

An adequate management between specialties with individualized interventions leads to an optimal outcome for each patient at surgery and rehabilitation [4].

2. Case Description

A 39-year-old patient consulted the ER on 09/11/2020 with clinical symptoms of approximately 36 hours of evolution due to a 3-meter-high fall. He initially consults to a second level hospital, where he is diagnosed with moderate traumatic brain injury, retrograde amnesia, otorrhagia, and muscular weakness with paresthesia in lower limbs. A lumbar spine computed axial tomography (CT scan) was performed with evidence of fracture at L1, burst mechanism with dorsal angulation and

involvement of the posterior column of the vertebral body was diagnosed. Immediate management with corticosteroid was initiated, and the patient was transferred to a fourth level complexity hospital.

Once the patient was admitted to the institution, he was assessed by orthopedics, spine surgery, and physical medicine and rehabilitation. His medical history was evaluated, he referred having no other medical backgrounds besides constipation and being overweight. During physical examination the patient is conscious, oriented, with no apparent cranial nerve deficit; bladder globe was reported positive, and the patient referred absence of miction for more than 10 hours therefore a vesical catheterization was ordered, other relevant findings were the absence of bulbocavernosus reflex and sphincter tone, pain during palpation in the lumbar region, left gluteal hematoma with paresthesia at L1 to L5 territory without a clear dermatome pattern associated, hypoesthesia at glans penis, no foot drop, and an adequate mobility of 4 limbs. Myotendinous reflexes were symmetric ++/++++ in 4 extremities. Previous Barthel score reported 100/100, and 60/100 at admission, the patient was considered a candidate for surgery.

A lumbosacral spine x-ray showed an upper plate fracture at L1 vertebrae with 33%. loss of height (Figure 1A and 1B), CT scan had findings compatible with compound upper end plate fracture of L1 vertebral body with extension to the lower end plate, and the posterior wall, with evidence of bone fragment that contacts the spinal canal decreasing its amplitude (Figure 2). Additionally, a magnetic resonance imaging was performed showing L1 fracture burst type with a reduction of the diameter of the canal by approximately 50%, with secondary compressive effect on the neighboring structures, an epidural laminar collection, which extended inferiorly to L3 vertebral body. Increased conus medullaris´ signal intensity in T2 sequences. Additionally, a small central intervertebral disc protrusion at L4 - L5 is mentioned (Figure 3). A diagnosis of L1 fracture type A4N3, with neurological compromise is established.

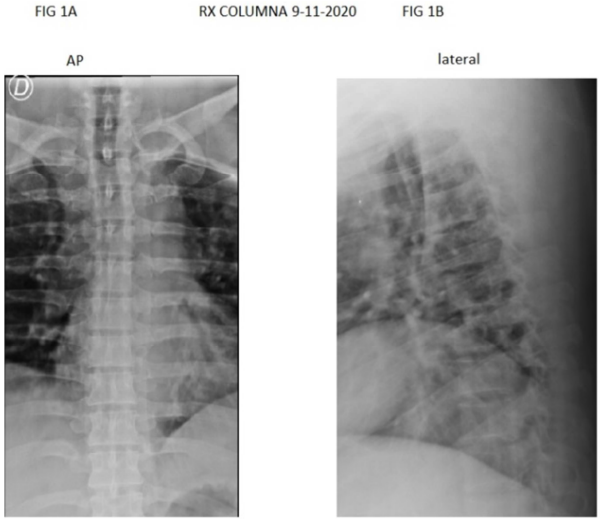


Figure 1. *Spine x-ray showed an upper plate fracture at L1 vertebrae with 33%. loss of height.*

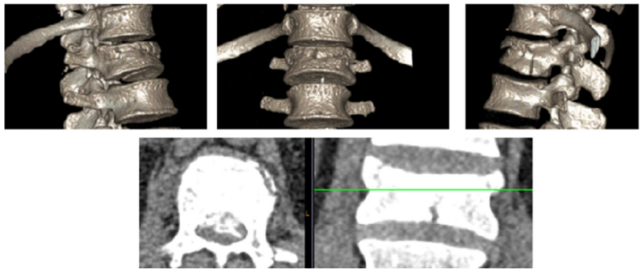


Figure 2. *Tomography with 3d Reconstruction. Fracture of the superior end plate of the vertebral body of L1.*

Figure 2 Compound fracture of the superior end plate of the vertebral body of L1, with loss of height of 33%, extension to the inferior end plate, and the posterior wall and presence of bone fragment that contacts the spinal canal decreasing its amplitude; the lateral recesses and the intervertebral foramen are wide. No paravertebral lesions are visualized. There is no evidence of abnormal curves. Conclusion: fracture of L1 that contacts the posterior wall and the spinal canal.

The patient is taken to an arthrodesis a decompression of the previously mentioned injuries on the 11/11/2020, somatosensory evoked potentials and electromyography are taken in the operating room as a baseline pattern for monitoring; there was evidence of a decrease in the amplitude of the action potential in the anal sphincter. The spinal surgery team proceeded to place percutaneous screws in T12 and L2 bilaterally, verifying in each screw the adequate continuity of the potentials after the procedure, and in the final potentials an increase in the amplitude in the EMG of the anal sphincter of approximately 3 times initial value (Figure 4). In the acute phase, Pain Management service initiated modulation of pain stated as VAS of 7/10 and a minimum of 5/10 and an occasional maximum of 9/10, physical medicine and rehabilitation service establishes rehabilitation objectives in acute time and management with physical and occupational therapy taking into account the patient's age and involvement of the conus medullaris, aiming to maintain and promote motor skills as well as maximum independence and functionality in daily activities, at the moment no external walking aids seemed necessary.

Figure 3. *Magnetic Resonance Imaging. We appreciate the fracture of the L1 vertebral body that have a bone fragment towards the canal.*

Figure 3 Fracture of the L1 vertebral body a subacute burst fracture of the L1 vertebral body, with retropulsion of the bone fragment towards the canal which it reduces by approximately 50%, with compressive effect on the neighboring structures and associated epidural laminar collection, which has inferior extension up to the L3 vertebral body, without compressive effect on the neighboring structures. Increased signal intensity in T2 sequences of the conus medullaris, without associated hemorrhagic component.

On his second postoperative day, the patient presented a normal bulbocavernous reflex and voluntary tone of the anal sphincter is recorded, with preserved muscle strength, however, bladder catheterization and the use of enemas were continued due to absence of bowel movements; as well the patient presented emotional lability, so interdisciplinary management with psychology was required.

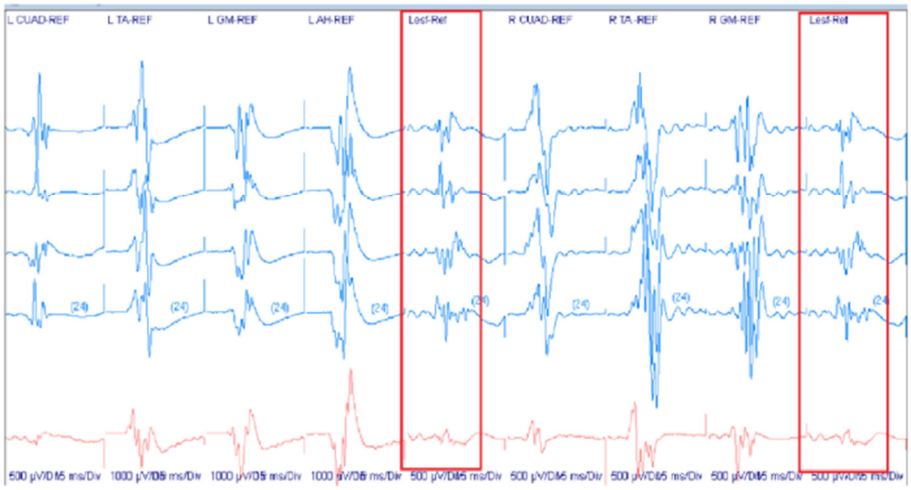
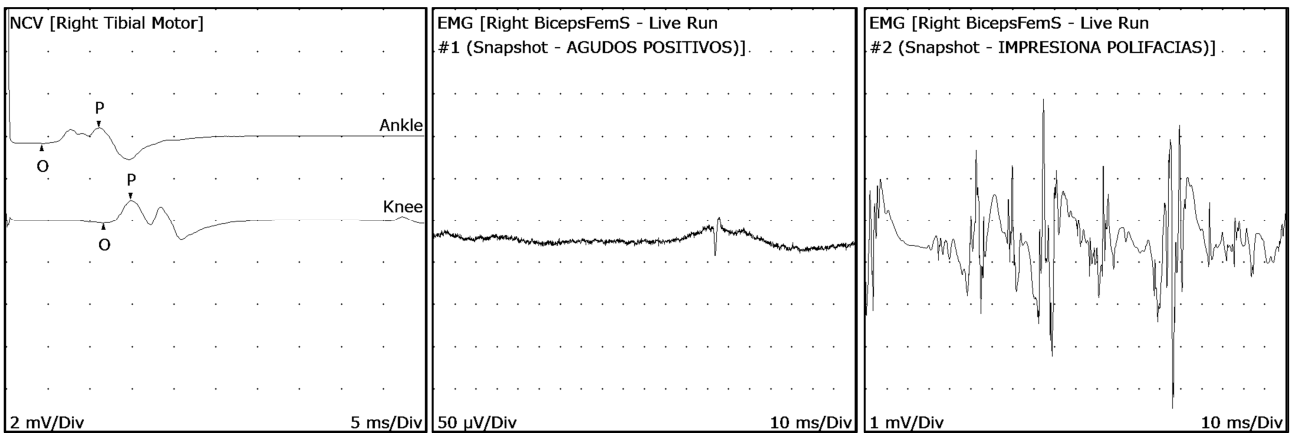


Figure 4. *Intraoperative monitoring, basal evoked potentials vs procedure recording potentials. the initial potentials show a significant amplitude change with respect to those taken at the end of the procedure.*

Figure 4 At the beginning of the procedure the potentials prior to the intervention are taken as a reference and are in red, those in blue are the last 4 records taken during the surgery with it is evidenced in the final potentials an increase in the amplitude in EMG of the anal sphincter of approximately 3 times in comparison with the previous study taken.

The patient continued improvement, on the 4th post-op day he presented spontaneous miction, stools and flatus, therefore, his management was switched to intermittent bladder catheterization, and changes in diet and pharmacological management of constipation were indicated. The urology service was consulted for neurogenic bladder, who considered that the patient needed to continue with intermittent catheterization, ambulatory control with and urodynamic study and pelvic floor therapy.

Prior to discharge on the 11/20/2020, an electrodiagnostic study was requested which reported bilateral tibial motor neuroconductions with normal distal latencies, decreased amplitudes and normal conduction velocity, electromyography of lower limbs with a monopolar needle electrode found normal insertion activity in right L5 myotome, electrical silence motor unit potentials (MU) at rest, polyphasic MUP, decreased recruitment and interference pattern +++/++++; anal sphincter EMG findings with increased insertion activity, signs of denervation at rest, MUP absent at rest despite tonic muscle activity, during muscle contraction polyphasic MUP, minimal left hemisphincter, greater amount right hemisphincter, decreased recruitment and interference pattern +/++++. The global findings were abnormal, compatible with lesion of lumbosacral roots L5 right and bilateral S2-S4, denervation and reinnervation were evidenced, in a subacute state (Figure 5).



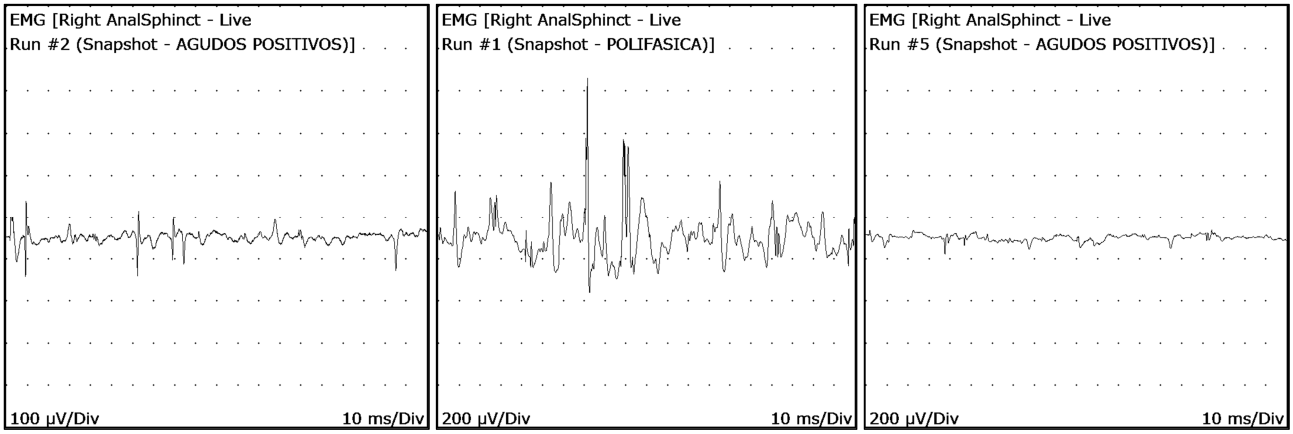


Figure 5. *Tibial motor neuroconductions with normal distal latencies, decreased amplitudes and normal conduction velocity, electromyography of lower limbs with a monopolar needle electrode finding normal insertion activity in right L5 myotome, electrical silence motor unit potentials (MUP) at rest, polyphasic mup, recruitment of the motor unit potentials at rest, polyphasic mup, decreased recruitment, EMG of anal sphincter with increased insertion activity, signs of denervation at rest, mup absent at rest despite tonic activity of the muscle, during muscle contraction polyphasic mup, increased right hemisphincter quantity.*

At 1 month follow-up he showed improvement in muscle strength in the lower limbs, no paresthesia, no use of bladder catheterization, preserved sensitivity in the perineal region and adequate sexual performance, occasional use of enemas, bowel movements every 3 days.

3. Discussion

Patients with conus medullaris syndrome are thought to be more frequent in the male population given the higher probability of experiencing a compressive thoracolumbar trauma, the approach starts from a complete clinical history and detailed questions about the episode and mechanism of trauma as shown. Spinal surgery history, use of anticoagulants, intravenous substance abuse, correlation with cancer, sports and work practices, or treatments that involve vertebral manipulation should be questioned [1, 2, 4, 5].

Among the symptoms, lumbar pain, changes in sensitivity and strength, hypoesthesia or anesthesia of the perineal region, changes in urinary and bowel habits, performance of sexual function, correlation of functionality in activities of daily living, and patient's occupation should be considered [1, 6].

Regarding the anatomy, the patient's lesion was inside anatomical limits for conus medullaris which may be between T11- L3 in adults [7], the characterization must be individualized and focusing on the upper and lower motor neuron signs, the evolution of tone, without omitting rectal tact, and sensitivity by dermatomes of the sacral region, and the possibility of classifying urinary retention; likewise, the classification ASIA for traumatic spinal cord lesions [8].

The complement with diagnostic images is established with magnetic resonance imaging as the "gold standard" since this evaluates the soft tissue components with greater sensitivity [6, 8], computed axial tomography for bone structures and adequate surgical planning [9, 10].

The literature indicates that recovery has prognostic factors such as the mechanism and level of the lesion, age, comorbidities, psychosocial factors, and the time of surgical intervention with an optimal prognosis if the surgery is performed during the initial 72 hours after the injury [4, 11, 12]. The intraoperative neurophysiological monitoring is considered a practice that facilitates and reduces the risk of complications as well as the supervision and dynamic management according to the reports [13-16]; Likewise, non-surgical management is included for the modulation of immunological reactions due to the damage caused [1, 3, 4, 8], and a rehabilitation program, which essentially starts from the patient's admission, guided by goals and objectives, and patient follow-up for new objectives or rethinking targets, and if necessary the need for the use of technical aids for walking or orthotic management [2, 17-20].

4. Conclusions

The present clinical case shows us that a young patient with spinal cord injury and compression by bone components, diagnosed with conus medullaris syndrome by clinical and imaging findings, benefits from an integral management with the proposed objectives, surgery and starting the rehabilitation plan designed for each one of the periods of the disease.

An adequate interdisciplinary conduct approaches each individual with specific and realistic objectives, with continuous assessments and always considering the possible progressions and/or variations of the patient’s state, explaining the complications inherent to the surgical and non-surgical component, for an optimal result according to the conditions and resources available.

Conflict of Interest

The authors declare that there are no conflicts of interest, the study did not receive any public or private funding and is the result of following the usual clinical practice of the investigators.

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