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Physiotherapy Management Of Lateral Medullary Infarct And Transverse Sigmoid Sinus Dural Arteriovenous Fistula

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ABSTRACT

Neurological disorders characterised by complex pathophysiology such as lateral medullary infarct (LMI), dural arteriovenous fistula (DAVF), and cerebral venous sinus thrombosis (CVST) compel thorough rehabilitation. To tackle the particular difficulties exhibited by these illnesses, physical therapists are essential. Because CVST typically presents itself with hemiparesis, seizures, and visual abnormalities, hence exercise intensity and safety must be carefully considered. DAVF may result in venous congestion, leading to motor and cognitive impairments, that can be rectified through targeted exercises and compensatory strategies. LMI, which can manifest by dysphagia, hoarseness, and ataxia, requires a multidisciplinary approach, including physical therapy interventions focused on balance, mobility, and functional activities.

By focusing the value of customized evaluation, goal-setting, and evidence-based therapies, this case report seeks to shed light on the physical therapy management of CVST, DAVF, and LMI in a patient. Physical therapists can maximize functional outcomes, improve quality of life, and facilitate effective community reintegration by addressing the unique rehabilitation requirements of these disorders.

Keywords: *Lateral medullary infarct, Transverse sigmoid sinus dural arteriovenous fistula, Physiotherapy management.*

1. INTRODUCTION

Cerebral venous sinus thrombosis (CVT) is characterized by the partial or complete occlusion of a cerebral venous sinus or vein, leading to impaired venous drainage and potential neurological complications. The clinical manifestations of CVT are highly variable, with headache being the most prevalent symptom, followed by seizures and paresis. Additionally, patients may present with focal neurological deficits or altered mental status [1].

Dural arteriovenous fistula (DAVF) is a rare, acquired intracranial vascular malformation involving an abnormal arteriovenous shunt within the dura mater. These lesions can develop at various locations within the dura, though they most commonly affect the transverse, sigmoid, and cavernous sinuses [2]. If left untreated, DAVF may lead to progressive neurological deterioration due to chronic venous congestion and secondary ischemic injury.

Wallenberg syndrome, also known as lateral medullary syndrome (LMS) or posterior inferior cerebellar artery (PICA) syndrome, is a neurological disorder resulting from damage to the lateral medulla, posterior to the inferior olivary nucleus. LMS and PICA-related infarctions are rare causes of stroke, typically arising from embolic or thrombotic occlusion of the PICA or vertebral artery [3].

The co-occurrence of CVT, DAVF, and lateral medullary infarction presents a complex clinical scenario necessitating a multidisciplinary rehabilitation approach. Rehabilitation efforts focus on restoring functional independence, enhancing motor coordination, and ensuring patient safety during mobility. Given the progressive nature of DAVF, continuous monitoring is essential for effective management.

This case underscores the need for an integrated, patient-centered approach to rehabilitation, aimed at optimizing functional recovery, minimizing complications, and improving overall quality of life.

This study was selected because it presents a rare and multifaceted neurological condition that requires a comprehensive rehabilitation approach. The combination of vascular abnormalities and brainstem involvement leads to significant challenges in mobility, coordination, and overall functional recovery. Given the progressive nature of these certain vascular conditions, continuous assessment and individualized therapy are essential to prevent further complications. This case report emphasizes the importance of a structured rehabilitation program aimed at maximizing independence, promoting neuroplasticity, and enhancing the patient's overall well-being. Moreover, documenting such an uncommon presentation contributes to clinical knowledge and informs future therapeutic strategies.

Case Report

A 51-year-old male with a history of chronic cerebral venous thrombosis (CVT) since 2021 presented with quadriparesis following endovascular embolization for a right transverse sigmoid sinus dural arteriovenous fistula (DAVF). He had previously recovered from a CVT-related venous infarction but was diagnosed with DAVF after a road accident in February 2024.

Post-procedure, he required tracheostomy and ventilation. He also underwent angioplasty for a left sigmoid sinus DAVF and was treated for a left tension pneumothorax with needle decompression and ICD placement.

An MRI brain with cervical spine screening revealed an acute infarction in the left lateral medulla, absent flow in the left transverse sinus, and cervical cord thrombosis. Cervical cord edema was also present.

On examination, the patient was conscious, alert, and well-oriented, with intact attention and memory. Despite having a tracheostomy, he communicated effectively. Motor assessment revealed firm muscle consistency with preserved deep tendon reflexes. He required heavy support for sitting, had poor pelvic bridging, and exhibited complete left-sided weakness with poor isolated joint movements on the right. A comprehensive assessment and the findings are mentioned in the table below (Table 1).

Table 1: Assessment

SCALES	PRE INTERVENTION	POST INTERVENTION
Posture Assessment Scale	4	14
Modified Rankin Scale	5	4
NIHSS	11	5

Table 2: Interventions

GOALS	INTERVENTIONS
Functional Independence	Based on the principles of Motor Relearning Programme (to left upper and lower limbs) Upper limb Supine to Side lying Sitting Standing Reaching and Kicking activities Postural Stability exercises

Strengthening	AROM AROM with weight cuffs (to right upper and lower limbs) Pelvic bridging VMO Strengthening Static quadriceps
Chest hygiene and lung capacity	Blowing exercises Deep Breathing Chest Percussions and Vibrations

2. DISCUSSION

The co-occurrence of cerebral venous sinus thrombosis (CVST) and dural arteriovenous fistula (DAVF) has been documented in the medical literature, with CVST potentially contributing to the development of DAVFs due to venous hypertension and subsequent angiogenesis [5]. However, the simultaneous presentation of lateral medullary infarction (LMI) alongside both CVST and DAVF is exceptionally rare. A comprehensive review of the existing literature reveals no previously reported cases detailing this specific triad of conditions. This underscores the uniqueness of the case, highlighting the need for its documentation to improve understanding of its pathophysiology, clinical implications, and therapeutic challenges.

Cerebral venous sinus thrombosis (CVT) is characterized by the partial or complete occlusion of a cerebral venous sinus or vein, leading to impaired cerebral venous drainage [1]. DAVFs are often considered acquired vascular malformations secondary to increased venous pressure, which may be associated with underlying venous thrombosis [2]. LMI typically results from occlusion of the vertebral artery or posterior inferior cerebellar artery (PICA), leading to ischemic damage in the lateral medulla [3]. While DAVFs can present with a wide spectrum of neurological symptoms depending on their location and venous drainage patterns, their direct association with LMI remains unclear. One possible mechanism may involve venous congestion impairing posterior circulation perfusion, subsequently resulting in ischemic changes within the brainstem [7].

Although Almutairi et al., Kamble et al., Sharma et al. Talk about physiotherapy interventions for the management of CVST, Herson et al., Kariya et al. talk about physiotherapy need for Lateral Medullary Infarct, specifically in acute phase, there are no reported cases describing the concurrent occurrence of this triad of conditions, and furthermore, no literature exists on the long-term physiotherapy management of such cases [10][11][12][13][3].

In the early stages of care, while the patient was in the intensive care unit (ICU), physiotherapy interventions included passive movements and chest physiotherapy (Kariya et al., 2024)[3]. As the patient's medical condition stabilized, mobilization was introduced in a stepwise manner [14]. Upon transfer to a rehabilitative care setting, physiotherapy management was tailored to address the specific deficits identified through a comprehensive pre-intervention physiotherapy assessment, as outlined in Table 1. By the time the patient was transitioned to rehabilitative care, near-complete motor control had been regained on the right side of the body, whereas significant impairments persisted on the left side.

The primary rehabilitation focus for the right side of the body was strength training [8]. Conversely, rehabilitation for the left side was structured according to the principles of the Motor Relearning Programme. Training interventions targeted upper limb function, supine-to-side lying transitions, sitting, and standing balance [6]. Postural stability training commenced once the patient achieved a satisfactory level of sitting balance [9]. By the end of six weeks, the patient exhibited substantial improvements, as evidenced by the post-intervention assessment detailed in Table 1 and the outcome measures listed in Table 3.

In addition to motor impairments, the patient experienced significant pulmonary complications, which led to reduced ventilatory capacity and excessive secretions, resulting in fatigue and frequent episodes of exhaustion. To address these issues, chest percussion was administered bi-hourly, and expiratory effort training was implemented to enhance pulmonary ventilation [15][16]. Relaxation techniques were incorporated to alleviate fatigue [17]. The patient was discharged at the end of the sixth week.

Over six weeks of rehabilitation, the patient demonstrated notable improvements in voluntary motor control, balance, and respiratory function, with moderate progress in reflex normalization and muscle tone regulation. However, persistent left

shoulder dysfunction, reactive balance deficits, and residual respiratory impairments highlight the need for continued intervention.

Neurological assessments showed a gradual reduction in hyperreflexia on the left side, particularly in the quadriceps and ankle reflexes, as seen in Table 1. This suggests a partial reduction in spasticity, likely due to functional training and tone modulation strategies. Additionally, the Babinski response improved on the right side, shifting from extensor to flexor, reflecting positive neuroplastic adaptations [7][8].

Muscle tone assessments revealed persistent Grade 1 spasticity in the left upper and lower limbs, with slight improvement in elbow flexors, which normalized over time. These findings align with evidence suggesting that task-specific rehabilitation can help manage spasticity and improve functional movement [6]. Similarly, Brunnstrom staging indicated notable gains in voluntary control, with improvements in the left upper limb, left hand, and right lower limb, while the right upper limb and hand reached full recovery. These advancements suggest enhanced isolated motor control, supporting neuroplastic adaptation in motor recovery [6].

Balance assessments demonstrated substantial improvements in anticipatory balance, progressing from poor to good in static conditions and from unassessable to fair in dynamic conditions. However, reactive balance remained poor, indicating residual deficits in postural control. Research supports the role of weight-shifting exercises and targeted balance training in improving postural stability post-stroke [6][9].Passive range of motion (PROM) testing indicated persistent left shoulder restrictions due to subluxation, with slight reductions in flexion and abduction. The lack of significant improvement underscores the need for continued joint protection strategies and strengthening interventions to prevent further deterioration [8].

Respiratory function assessments showed a reduction in secretion load, particularly in the right lung, reflecting the effectiveness of airway clearance techniques. Additionally, chest expansion at the xiphoid level increased, suggesting improved diaphragmatic mobility, while axillary and nipple-level expansion remained stable. The patient's expiratory effort improved from poor to fair, likely due to breathing exercises and chest physiotherapy interventions [15][16].

In summary, rehabilitation resulted in significant functional gains, particularly in motor control, postural stability, and respiratory function. However, persistent left shoulder dysfunction, reactive balance deficits, and residual respiratory limitations emphasize the need for continued strength training, proprioceptive exercises, and advanced postural control interventions to further enhance recovery.

The patient's progress was evident through the comparison of pre-intervention and post-intervention assessments, as documented in Table 1, with outcome measures detailed in Table 3. The findings of this study demonstrate the effectiveness of a structured rehabilitation program in improving postural control, functional independence, and neurological recovery in a patient with a complex neurovascular condition. Using standardized assessment tools—Posture Assessment Scale (PAS), Modified Rankin Scale (mRS), and National Institutes of Health Stroke Scale (NIHSS)—provided objective evidence of progress, reflecting meaningful functional gains post-intervention.

The Posture Assessment Scale (PAS), which evaluates postural stability in sitting and standing, showed a significant improvement from a pre-intervention score of 4 to 14 post-intervention. This suggests enhanced balance, coordination, and core stability, likely achieved through targeted physiotherapy interventions focusing on proprioception, weight shifting, and trunk control. Postural control plays a crucial role in mobility and functional independence in patients recovering from neurological impairments [8][9][14].

Similarly, the Modified Rankin Scale (mRS), which assesses the degree of disability, improved from 5 to 4, indicating a transition from severe to moderate disability. While the patient still required assistance, this reduction signifies an improvement in daily function and self-care abilities. Evidence suggests that rehabilitation programs incorporating task-specific training and motor relearning can significantly enhance independence in patients with neurological deficits [6][8][9].

The National Institutes of Health Stroke Scale (NIHSS), used to assess stroke severity, improved from 11 to 5, reflecting a notable reduction in neurological impairments. This improvement suggests better motor function, coordination, and cognitive processing, indicating neuroplastic changes facilitated by rehabilitation. Studies have shown that early and intensive rehabilitation can promote neurological recovery by enhancing adaptive mechanisms and compensatory strategies [6][8][9][14].

These improvements underscore the importance of a multidisciplinary and patient-centered rehabilitation approach that targets postural instability, motor deficits, and functional impairments. The substantial progress observed across all three assessment tools highlights the crucial role of physiotherapy in optimizing recovery and improving quality of life. Future research should explore the long-term sustainability of these functional gains and the potential benefits of continued rehabilitation beyond the initial recovery phase.

REFERENCES

[1] Moraes Junior AA, Conforto AB. Cerebral venous thrombosis. Arq Neuropsiquiatr. 2022;80(5 Suppl. 1):53-9.

[2] Miller TR, Gandhi D. Intracranial dural arteriovenous fistulae: clinical presentation and management strategies. Stroke. 2015;46(7):2017-25.

[3] Kariya G, Singh RM, Sheikh T. Rehabilitation and physiotherapy action strategy for an acute case of lateral medullary syndrome: a case report. Cureus. 2024 Sep 26;16(9):e70242. 6, 15

[4] GBD 2016 Neurology Collaborators. Global, regional, and national burden of neurological disorders, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2019;18(5):459-80.

[5] Huang Y, Zhang Y, Zhang J, Zhang Y, Zhang Q, Zhang Y, et al. Clinical characteristics and outcome of dural arteriovenous fistulas secondary to cerebral venous sinus thrombosis: a primary or secondary event? BMC Neurol. 2023;23(1):131.

[6] O'Rourke C, Edwards D. The effectiveness of the motor relearning program on upper limb function post-stroke: a systematized review. Phys Ther Rev. 2024;29(1-3):87-100.

[7] Fan JL, Brassard P, Rickards CA, Nogueira RC, Nasr N, McBryde FD, et al. Integrative cerebral blood flow regulation in ischemic stroke. J Cereb Blood Flow Metab. 2021;41(10):2663-80.

[8] Ada L, Dorsch S, Canning CG. Strengthening interventions increase strength and improve activity after stroke: a systematic review. Aust J Physiother. 2006;52(4):241-8.

[9] Van Criekinge T, Truijen S, Schröder J, Maebe Z, Saeys W. The effectiveness of trunk training on trunk control, sitting and standing balance, and mobility post-stroke: a systematic review and meta-analysis. Clin Rehabil. 2019;33(6):992-1002. doi:10.1177/0269215519830159.

[10] Almutairi NM, Albuhayjani AA. Rehabilitation of post-cerebral venous thrombosis. Cureus. 2023 Jan 8;15(1):e33512. doi:10.7759/cureus.33512.

[11] Kamble KG, Joshi PC, Palekar TJ. A rare case of cerebral venous sinus thrombosis in a 39-year-old woman because of oral contraceptive pills: a case report with emphasis on physiotherapy. Int J Health Sci Res. 2024;14(2):143-8. doi:10.52403/ijhsr.20240218.

[12] Sharma V, Samal S, Morgade S, Kovela RK, Dagal R, Thimoty R. Efficacy of physiotherapy rehabilitation for hemiparesis following cerebral venous sinus thrombosis: a rare case report. J Pharm Res Int. 2022;34(1A):43-7. doi:10.9734/jpri/2022/v34i1A35345.

[13] Herson AB, Falk JD, Phrathep DD, Igbonagwam CB, Fischer ST, Miller BT, et al. The value of interdisciplinary collaboration in lateral medullary syndrome rehabilitation: a case report. Cureus. 2023;15(6):e40065. doi:10.7759/cureus.40065.

[14] Sundseth A, Thommessen B, Rønning OM. Outcome after mobilization within 24 hours of acute stroke: a randomized controlled trial. Stroke. 2012 Sep;43(9):2389-94. doi: 10.1161/STROKEAHA.111.646687. Epub 2012 Jun 14.

[15] Inayat F, Ullah MJ, Imad T, Zia H. The role of chest physiotherapy in stroke patients: a narrative review. Tech Neurosurg Neurol. 2021;4(5):617.

[16] Winkle MJ, Sankari A. Respiratory muscle strength training [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2024 May 1; cited 2025 Mar 4]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK603753/

[17] Norelli SK, Long A, Krepps JM. Relaxation techniques [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2023 Aug 28; cited 2025 Mar 4]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513238/