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Comprehensive Rehabilitation Strategies for Pushers Syndrome and Hemineglect- A Case Report

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Abstract

Stroke is one of the leading causes of death and disability in India. It can lead to complications like pusher's syndrome and hemineglect. Pusher's syndrome is characterized by a strong tendency to push towards the paralyzed side, resulting in postural instability and an increased risk of falls. On the other hand, hemineglect is a condition where the patient is unaware of the affected side, often associated with lesions in the right hemisphere. These complications not only hinder the recovery process but also significantly impact the patient's functional outcomes. This study aims to explores comprehensive rehabilitation strategies for addressing lateropulsion and hemineglect in stroke patients and assessing their effectiveness in improving balance, spatial awareness and functional outcomes. This case report explores the rehabilitation of a 64-year-old man who developed pusher's syndrome and hemineglect one month following a stroke. The rehabilitation program, conducted over six weeks, included strategies such as visual feedback, visual deprivation therapy, limb activation therapy, auditory cues, and treadmill-supported body weight training to address both pushing behaviour and hemineglect. Progress was monitored using the Burke Lateropulsion Scale (BLS), the Catherine Bergego Scale (CBS), and Functional Independent Measure (FIM) score. By the end of the six weeks, the patient showed significant improvement in both pushing behaviour and hemineglect. A comprehensive rehabilitation approach not only aids in overcoming pushing behaviour and hemineglect but also enhances the overall functional outcomes for stroke patients.

Keywords*: Hemineglect, Pusher's Syndrome, Rehabilitation, Stroke.*

Introduction

Stroke or cerebrovascular accidents (CVA) occurs when the blow flood in the cerebral cortex is disrupted, most of the CVA's, up to 85% are ischemic strokes and the rest being hemorrhagic. Major modifiable and most likely risk factors of stroke are hypertension, diabetes, smoking, obesity, atrial fibrillation, and chronic drug use. In the United States, stroke is the fifth leading cause of death, commonly affecting 8,00,000 people every year leading to being the common cause for disability [1-4]. The incidence of stroke is raising in India. Research indicates the yearly occurrence of stroke varies between 105 and 152 per 1,00,000 people, Stroke is the fourth common cause for mortality and fifth leading cause of disability among the Indian population [5] and about 5.8 million people reported with stroke in 2005 [6]. According to the global factsheet, the lifetime risk of suffering a stroke has risen by 50% over the last 17 years [7]. Pusher syndrome is a rare post-stroke condition in which patients lean away from the affected hemisphere and resist to postural correction. They push with their unaffected limbs, causing falls toward the paralyzed side due to a distorted perception of body orientation relative to gravity [8]. A study showed Pathological pushing (PB) occurred in 9.4% of 1,660 acute stroke patients and 14.2%

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of those with lower limb impairments, all exhibiting motor deficits. This aligns with previous prevalence rates of 10% to 16% [9]. Body orientation perception integrates signals from the vestibular, visual, and somatosensory systems through three channels: visual vertical (VV), postural vertical (PV), and haptic vertical (HV). Disruption in any of these can cause posture and balance disorders. This includes pathological pushing behaviour [10]. The commonly used clinical tools for assessing the pusher syndrome are scale for contraversive pushing, Modified contraversive pushing and Burke lateropulsion scale [11]. The treatment framework is grounded in previously proposed strategies, emphasizes using visual cues as an approach for patients with Pusher Syndrome (PS) who have distorted vertical postural sense. Incorporating visual feedback, tactile stimulation, and auditory feedback during therapy for patients aims to deal with the mismatch in their sensation [12]. Hemispatial neglect is a failure to orient or respond to any stimulus on the side opposite a brain lesion, commonly seen in CVA patients with hemiplegia. It affects approximately 30% of stroke survivors. The condition is linked to spatial attention control in the right hemisphere, with severe neglect typically occurring after right-sided brain damage [13]. Neglect results from interhemispheric imbalance after right hemisphere damage, causing attention and eye movements to shift towards the right. Its presence is linked to a poor prognosis for long-term independent functioning [14]. Visual deprivation therapy compared to conventional visual feedback based techniques have proven to show promising results in patients with hemineglect [15].

This case report focuses on various rehabilitation strategies used to treat hemiplegic patient presenting with pusher's syndrome and hemineglect. It focuses on targeted rehabilitation strategies to improve the pushing behaviour exhibited by patient, manage hemineglect and improve functional outcomes.

Case Report

A male patient aged 64 years, presented with a history of atrial fibrillation, hypertension, and diabetes mellitus (type 2) suffered a CVA (Right MCA territory infarct with haemorrhagic transformation), resulting in contralateral motor, sensory loss and dependent on others for all ADLs. During acute management, he had fluctuating blood sugar levels which were managed with oral hypoglycaemic agents. He also had recurrent UTIs, treated with antibiotics based on culture and sensitivity. He experienced urinary issues, including frequent diaper wetting despite an indwelling catheter, and was started on bladder management medications. Additionally, he was also treated for acute gastroenteritis, upper respiratory infections, neck spasms, constipation, and sleeping difficulties. He had persistent left shoulder pain, unresponsive to analgesics, improved slightly following corticosteroid, bupivacaine injections and physical therapy. Psychiatric evaluation revealed post-stroke depression, managed with antidepressants. He was dependent on ryles tube for feeding which was removed after he was able to tolerate oral fluids. His balance was complicated by pusher syndrome and left hemineglect. Despite multidisciplinary care involving antihypertensives, antiplatelets, antiarrhythmics, antihyperlipidemics, spasticity management, he was not completely independent, with ongoing challenges related to pain, recurrent infections, and visual impairments.

Clinical Examination

After a month following stroke, the patient was medically stable and admitted to a comprehensive rehabilitation facility. A thorough objective examination was carried out. Motor examination revealed weakness of left upper and lower limbs. Spasticity noted on the left upper and lower limbs was assessed using Modified Ashworth Scale (MAS) showing the following grades, elbow flexors-2,

wrist flexors-2, fingers flexors-3, hip extensors-1+, knee extensors-2 and ankle dorsiflexors-3. According to Brunnstrom stages of recovery, recovery noticed in patient were, shoulder and elbow- stage 3, wrist and fingers - stage 2, hip and knee- stage 4 and ankle- stage 3. Reflex examination showed hyperreflexia on the left (biceps, triceps, patellar & ankle) and positive Babinski sign. During sensory examination there was reduced sensation to pain, touch, proprioception and vibration. Coordination assessment (finger-to-nose and heel-to-shin) on the right side was normal and on the left side, there was incoordination. Hemineglect screening was done using bisection test and neglect to the left side was also noted by the patient's attender during ADL's, prompting further evaluation using the Catherine Bergego Scale (CBS) administered through the Kessler Foundation Neglect Assessment Process (KF-NAP™). The pre-test score was 22/30, indicating the presence of hemineglect. During postural and balance assessment, static sitting balance was fair and dynamic was poor with the patient exhibiting a significant pushing behaviour towards the hemiparetic side. Resistance was also noted when attempted to push the patient towards the unaffected side. The Burke Lateropulsion Scale was used to assess this pushing behaviour, reflecting a score of 11/17, suggesting substantial lateropulsion.

This study was approved by the Institutional Ethics Committee for Human Research under the protocol number 08/07/2024/ISRB/FR/SCPT. The patient was clearly instructed about the procedure and a consent was taken for treatment, with confidentiality being upheld. The patient received intensive physical therapy consisting of two 45-minute sessions per day, six days a week for 6 weeks. These sessions were meticulously tailored to address the patient's evolving needs, with a focus on improving physical impairments and enhancing functional independence.

Intervention

To address the hemineglect, non-powered eye glasses were used where, the right side was patched using black coloured tape (visual deprivation therapy). This limited the visual input from right side, stimulating inputs from the left sided vision thereby encouraging the patient to focus attention on the neglected left side. Additionally, limb activation therapy was incorporated by encouraging the usage of the affected limbs which promoted engagement of the left side of the body. Visual feedback through the use of a mirror and brightly coloured cones was employed to facilitate spatial awareness and attentional control during both sitting and standing activities. The condition was explained to the care taker of the patient to enhance the patient's attention towards the left side during activities like brushing, eating, grooming and dressing. This approach aimed to improve environmental interaction and promote better focus on the neglected side, ultimately enhancing the patient's overall functional recovery.

Rehabilitation strategies mentioned below were used and by the end of the four-week period, a noticeable improvement in the patient's pushing behaviour was observed, transitioning from strong resistance to mild.

Sitting

Initially, the patient struggled with balance while sitting unsupported. Using a long mirror for visual feedback, the patient was encouraged to maintain alignment and balance. Dynamic sitting balance activities included trunk rotation, side and forward-reaching tasks with the therapist seated by the affected side giving constant facilitation and auditory cues. These tasks were initially performed at short distances and was gradually progressed. A swiss ball was placed on the unaffected side and the patient was constantly asked to shift weight towards the ball looking at the mirror which provided a visual feedback and limited the pushing behaviour to the affected side.

Transfers

At the start of the rehabilitation process, the patient relied heavily on a wheelchair propelled by his attender for transfers. Sit-to-stand training was initiated within parallel bars to build confidence and bring the patient out of wheelchair promoting independent ambulation. The patient initially required maximum support from the therapist and higher seat height for easier transfers. With consistent training and auditory cues, the patient made significant progress, ultimately performing sit-to-stand transfers with minimal assistance.

Standing

The patient initially required substantial support while standing, but visual feedback from a full-length mirror was used to improve posture and static standing balance. After mastering static balance, dynamic balance activities were introduced, including stepping and forward reaching tasks with help of visual feedback, auditory cues and manual support by the therapist inhibiting pushing towards to left side. Figure.1 represents dynamic standing forward reaching activity incorporating visual feedback using a full length mirror. The patient demonstrated significant improvement, reaching a point where he was able to maintain good standing balance independently under supervision using a hemi-walker. Training on uneven surfaces further enhanced his balance and confidence in standing.

Figure 1. Dynamic Standing Incorporating Visual Feedback

Walking

Walking initially proved to be challenging for the patient. A body weight supported treadmill training at a speed 0.8kmph, incorporating visual feedback using a full-size mirror was used alongside a long knee brace and leaf ankle-foot orthosis (AFO) on the left side to facilitate gait initiation. The patient initially required manual facilitation for hip flexion and was able to take only a few steps. Over time, with gradual reduction of the body weight support, the patient gained the ability to walk on even surfaces using a hemi-walker and leaf AFO, requiring minimal therapist support. This significant improvement in gait was a breakthrough in the patient's mobility, increasing both his confidence and independence.

Results

After 6 weeks of comprehensive rehab, the patient showed significant improvements in the outcome measures. Table 1 displays the outcomes of pre and post-test.

Table 1. Outcome Measurements Showing Scales used for Assessment with their Pre and Post-test Values

Scales	Pre-test	Post-test
FIM	55/126	71/126
Catherine Bergego Scale	22/30	6/30
Burke Lateropulsion scale	11/17	5/17

Discussion

Framing a rehabilitation strategy for stroke patients with complications like pushing behaviour and hemineglect can be challenging. This case reports focuses on comprehensive rehabilitation strategies to address the pushing behaviour and hemineglect.

This case study contributes valuable insights into the management of pusher syndrome and hemineglect in stroke patients, particularly incorporating comprehensive rehabilitation strategies. A review of the existing literature reveals a growing body of evidence suggesting that therapies incorporating visual and auditory feedback significantly improves motor control and postural orientation in patients with the pusher's syndrome. Several studies have explored the effects of somatosensory inputs, such as single-leg exercises and weight-bearing on both the affected and non-affected sides, on pusher behaviour. However, these interventions, as shown in previous research, often fail to yield immediate results in terms of correcting pushing behavior. In contrast, interventions that integrate visual and auditory feedback, such as those used in our case study, appear to have an immediate and profound impact. The patient in this study exhibited marked improvements in postural control and standing independence after receiving therapy incorporating both auditory cues and visual feedback. This aligns with findings from other studies, which have consistently demonstrated that dynamic auditory cues, especially those moving toward the neglected side, can reduce the severity of neglect and enhance the rehabilitation process [16].

Furthermore, the use of Lateral Stepping-Bodyweight Supported Treadmill Training (LS-BWSTT), which emphasizes graviceptive sensory inputs has shown promise in managing pusher syndrome. By encouraging lateral stepping and weight shifts through the paretic leg, LS-BWSTT targets the motor deficits, reinforcing task-specific exercises. Our case study mirrors these principles, as the patient responded well to interventions that emphasised weight shifting and sensory integration, confirming the relevance of this approach in the context of pusher syndrome [17].

Looking at auditory cueing for egocentric neglect, the existing literature underscores its potential in facilitating motor adjustments and orienting the body in space. The effectiveness of auditory cues, particularly those moving toward the neglected side, is well-documented in studies, which show a reduction in neglect severity with the addition of these cues. This aligns with the findings in our case study, where the combination of visual and auditory cues produced immediate improvements in the patient's functional mobility and postural alignment [18].

Additionally, multisensory stimulation (MS) interventions, which include audio-visual feedback, have been shown to yield significant improvements in patients with unilateral spatial neglect (USN). MS has been found to be especially effective in improving personal neglect, a benefit not observed in other interventions like Prism Adaptation (PA). Our case study also highlights the potential of integrating stimulation techniques, as the patient demonstrated considerable progress in

personal neglect tasks. These findings support the idea that multisensory rehabilitation approaches, combining both visual and auditory feedback, offer a promising pathway for improving the rehabilitation outcomes for patients with neglect and pushing behaviours [19].

The literature also indicates that patients with lateropulsion, such as those with pusher syndrome, require a longer rehabilitation period usually, an additional 4 to 6 weeks when compared to patients without this condition [20]. This finding was consistent with our case study, where the patient required 3 to 4 weeks of additional therapy to achieve consistent improvements in ambulation and functional tasks. Despite these advancements, it is important to acknowledge that lateropulsion may take up to a year to fully resolve, with many patients experiencing a decline in functional status post-discharge [21].

The results of this study are consistent with previous research on visuomotor feedback training (VFT) and other interventions for neglect. A trial involving 20 patients with hemineglect showed that home-based VFT led to significant improvements in daily living activities, reinforcing the notion that sensory feedback interventions can greatly enhance patient independence and functional performance [22]. Similarly, a research comparing visual scanning training (VST), limb activation treatment (LAT), and prism adaptation (PA) found that all three interventions produced beneficial effects in tasks related to peripersonal space. Our case study's results contribute to these findings, as the combination of visual and auditory cues led to significant functional improvements in the patient's interaction with their environment [23]. The findings in our case study are consistent with existing literature, which emphasizes the importance of integrating sensory inputs to enhance rehabilitation outcomes for patients with pusher's syndrome and hemineglect.

Conclusion

The integration of comprehensive rehabilitation strategies proved to be effective in managing both lateropulsion and hemineglect, ultimately leading to significant gains in the patient's independence. Improvements were observed with the patient's pushing behaviour and hemineglect showing noticeable reduction during both sitting and standing activities. Additionally, the combination of body-weight supported treadmill training alongside visual and auditory feedback proved to be effective and showed progress in the patient's ambulation. This comprehensive approach not only enhanced functional mobility but also provided the patient with confidence in daily activities.

Conflict of interest

Nil.

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References

[1]. Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., Das, S. R., De Ferranti, S., Després, J.-P., Fullerton, H. J., Howard, V. J., Huffman, M. D., Isasi, C. R., Jiménez, M. C., Judd, S. E., Kissela, B. M., Lichtman, J. H., Lisabeth, L. D., Liu, S., Mackey, R. H., Magid, D. J., McGuire, D. K., Mohler, E. R., Moy, C. S., Muntner, P., Mussolino, M. E., Nasir, K., Neumar, R. W., Nichol, G., Palaniappan, L., Pandey, D. K., Reeves, M. J., Rodriguez, C. J.,

Rosamond, W., Sorlie, P. D., Stein, J., Towfighi, A., Turan, T. N., Virani, S. S., Woo, D., Yeh, R. W., Turner, M. B., 2016, Heart Disease and Stroke Statistics—2016 Update: A Report From the American Heart Association. *Circulation 133.* https://doi.org/10.1161/CIR.0000000000000350

[2]. Xing, C., Arai, K., Lo, E. H., Hommel, M., 2012, Pathophysiologic Cascades in Ischemic Stroke. *International Journal of Stroke* 7, 378–385. https://doi.org/10.1111/j.1747-4949.2012.00839.x

[3]. Krishnamurthi, R. V., Moran, A. E., Feigin, V. L., Barker-Collo, S., Norrving, B., Mensah, G. A., Taylor, S., Naghavi, M., Forouzanfar, M. H., Nguyen, G., Johnson, C. O., Vos, T., Murray, C. J. L., Roth, G. A., for the GBD 2013, Stroke Panel Experts Group, 2015. Stroke Prevalence, Mortality and Disability-Adjusted Life Years in Adults Aged 20-64 Years in 1990-2013: Data from the Global Burden of Disease 2013 Study. *Neuroepidemiology 45 (3)*, 190–202. https://doi.org/10.1159/000441098

[4]. Bhuvana Kalaivanan, Prathap Suganthirababu, Vignesh Srinivasan, Sathya Siva., 2025, The Effectiveness of Circumferential Pressure using Sphygmomanometer on Spasticity and Gait Pattern among Post Stroke patients – A Feasibility Study. *Research Journal Pharmacy and Tachnology*, 18(3):1161. https://doi.org/10.52711/0974-360X.2025.00167

[5]. Jones, S. P., Baqai, K., Clegg, A., Georgiou, R., Harris, C., Holland, E.-J., Kalkonde, Y., Lightbody, C. E., Maulik, P. K., Srivastava, P. M., Pandian, J. D., Kulsum, P., Sylaja, P., Watkins, C. L., Hackett, M. L., 2022, Stroke in India: A systematic review of the incidence, prevalence, and case fatality. *International Journal of Stroke 17*, 132–140. https://doi.org/10.1177/17474930211027834

[6]. Umasankar, Y., Srinivasan, V., Suganthirababu, P., and Murugaiyan, P., 2024, Efficacy of Proprioceptive Neuromuscular Facilitation on Jaw Function in Bruxism Among Post Stroke Survivor: A Case Study. *International Journal of Experimental Research and Review*, *42*. https://doi.org/10.52756/ijerr.2024.v42.025

[7]. Iyyapan, G and Maragatham, S., 2024, Blood Glucose as Potential Indicators for Hospital Mortality among Patients with Acute Stroke in a Tertiary Hospital, India. *Journal of Pharmacy and Bioallied Sciences*, 16(Suppl 3), pp.S2922-S2924. https://doi.org/10.4103/jpbs.jpbs_628_24

[8]. Cardoen, S., Santens, P., 2010, Posterior pusher syndrome: A report of two cases. *Clinical Neurology and Neurosurgery 112*, 347–349. https://doi.org/10.1016/j.clineuro.2009.12.007

[9]. Clery, A., Bhalla, A., Rudd, A. G., Wolfe, C. D., and Wang, Y., 2020, Trends in prevalence of acute stroke impairments: A population-based cohort study using the South London Stroke Register. *PLoS Medicine, 17(10),* p.e1003366. https://doi.org/10.1371/journal.pmed.1003366

[10]. Britton, Z., and Arshad, Q., 2019, Vestibular and multi-sensory influences upon self-motion perception and the consequences for human behavior. *Frontiers in neurology, 10,* p.63. https://doi.org/10.3389/fneur.2019.00063

[11]. Koter, R., Regan, S., Clark, C., Huang, V., Mosley, M., Wyant, E., Cook, C., and Hoder, J., 2017, Clinical outcome measures for lateropulsion poststroke: an updated systematic review. *Journal of neurologic physical therapy, 41(3),* pp.145-155. https://doi.org/10.1097/NPT.0000000000000194

[12]. Pardo, V., and Galen, S., 2019, Treatment interventions for pusher syndrome: A case series. *NeuroRehabilitation*, *44*(1), pp.131-140. https://doi.org/10.3233/NRE-182549

[13]. Anand, P., Mohanty, U., and Mani, S., 2022, Brain gym exercises and mirror box therapy in hemispatial neglect post-stroke: A randomised clinical trial. *International Journal of Health Sciences*, *6.* https://doi.org/10.53730/ijhs.v6nS4.9339

[14]. Li, K., and Malhotra, P. A., 2015, Spatial neglect. *Practical neurology, 15(5),* pp.333-339. https://doi.org/10.1136/practneurol-2015-001115

[15]. Zhang, Q., Zhang, L., He, W., Zheng, X., Zhao, Z., Li, Y., Xu, S., Zheng, J., Zhuang, X., Jia, W., and Zhu, C., 2021, Case report: visual deprivation in Pusher syndrome complicated by hemispatial neglect after basal ganglia stroke. *Frontiers in Neurology, 12*, p.706611. https://doi.org/10.3389/fneur.2021.706611

[16]. Gomez-Risquet, M., Hochsprung, A., Magni, E., and Luque-Moreno, C., 2024, Feedback

Interventions in Motor Recovery of Lateropulsion after Stroke: A Literature Review and Case Series. *Brain Sciences, 14(7),* p.682. https://doi.org/10.3390/brainsci14070682

[17]. Romick-Sheldon, D., Kimalat, A., 2017, Novel Treatment Approach to Contraversive Pushing after Acute Stroke: A Case Report. *Physiotherapy Canada 69,* 313–317. https://doi.org/10.3138/ptc.2016-28

[18]. Schenke, N., Franke, R., Puschmann, S., Turgut, N., Kastrup, A., Thiel, C. M., Hildebrandt, H., 2021, Can auditory cues improve visuo-spatial neglect? Results of two pilot studies. *Neuropsychological Rehabilitation 31,* 710–730. https://doi.org/10.1080/09602011.2020.1727931

[19]. Zigiotto, L., Damora, A., Albini, F., Casati, C., Scrocco, G., Mancuso, M., Tesio, L., Vallar, G., Bolognini, N., 2021, Multisensory stimulation for the rehabilitation of unilateral spatial neglect. *Neuropsychological Rehabilitation 31,* 1410–1443. https://doi.org/10.1080/09602011.2020.1779754

[20]. Nolan, J., Godecke, E., and Singer, B., 2022, The association between contraversive lateropulsion and outcomes post stroke: a systematic review. *Topics in stroke rehabilitation, 29(2),* pp.92-102. https://doi.org/10.1080/10749357.2021.1886640

[21]. Nolan, J., Jacques, A., Godecke, E., Bynevelt, M., Dharsono, F., Singer, B., 2024, Lateropulsion resolution and outcomes up to one year post-stroke: a prospective, longitudinal cohort study. *Topics in Stroke Rehabilitation 31,* 795–806. https://doi.org/10.1080/10749357.2024.2333186

[22]. Rossit, S., Benwell, C. S., Szymanek, L., Learmonth, G., McKernan-Ward, L., Corrigan, E., Muir, K., Reeves, I., Duncan, G., Birschel, P., and Roberts, M., 2019, Efficacy of home-based visuomotor feedback training in stroke patients with chronic hemispatial neglect. *Neuropsychological rehabilitation, 29(2),* pp.251-272. https://doi.org/10.1080/09602011.2016.1273119

[23]. Priftis, K., Passarini, L., Pilosio, C., Meneghello, F., and Pitteri, M., 2013, Visual scanning training, limb activation treatment, and prism adaptation for rehabilitating left neglect: who is the winner?. *Frontiers in Human Neuroscience, 7,* p.360. https://doi.org/10.3389/fnhum.2013.00360