EAJNS East African Journal of Neurological Sciences
Official journal of East African Association of Neurological Surgeons

Case report EAJNS 5(1): 43-46

Hereditary Spastic Paraplegia: Diagnostic and Management Challenges in Resources-limited setting – A Case Report and Literature Review

Authors: Emeka A. Clement[1] Rim Moufakkir[1] Houyam Tibar[1] Wafa Regragui[1]
Affiliations: Mohammed V University, Faculty of Medicine and Pharmacy, Rabat
Corresponding author: Emeka Alfred Clement; Email: emekaalfread_clement@um5.ac.ma
Received:12-10-2024; Revised:02-06-2025 ; Accepted: 22-06-2025
DOI: https://dx.doi.org/10.4314/eajns.v5i1.6

Abstract

Hereditary spastic paraplegias (HSPs) are a group of genetically heterogeneous neurodegenerative disorders characterized primarily by progressive lower-limb spasticity. Diagnosis is often challenging in low- and middle-income countries (LMICs) due to limited access to advanced diagnostics and rehabilitation. We present a case of a 37-year-old male with progressive lower limb spasticity and gait abnormalities. Diagnostic efforts were hindered by the unavailability of genetic testing, financial constraints, and inaccurate family history due to low health literacy. Despite these challenges, a diagnosis of HSP was made based on clinical and radiological evaluation. This case highlights the diagnostic and management difficulties of HSPs in resource-limited settings and underscores the need for improved access to genetic testing and multidisciplinary care.

Keywords: Hereditary spastic paraplegia, Low and middle income countries, genetic diagnosis, Lower limb spasticity.

INTRODUCTION

Hereditary spastic paraplegia (HSP) refers to a diverse group of inherited neuro- degenerative disorders primarily characterized by progressive spasticity and weakness of the lower limbs(1). HSPs are broadly classified into two categories: "pure" forms, which present solely with lower limb spasticity and hyperreflexia, and "complicated" forms, which are associated with additional neurologic or systemic features. These may include intellectual disability, epilepsy, optic atrophy, extrapyramidal signs, sensorineural hearing loss, cerebellar dysfunction, muscle wasting, and dermatologic abnormalities such as ichthyosis(2).

From a genetic perspective, HSPs demonstrate considerable heterogeneity, encompassing autosomal dominant, autosomal recessive, and X-linked recessive inheritance patterns. Among these, autosomal recessive forms are more commonly encountered, particularly in populations with a high rate of consanguinity(2). A frequently implicated genetic locus is found on chromosome 15q13-15, where mutations in the *SPG11* gene have been shown to account for 41–77% of reported cases of autosomal recessive HSP (3).

Despite advances in genetic mapping and molecular diagnostics, the clinical and diagnostic management of HSP remains challenging in low- and middle-income countries (LMICs), where access to genetic testing and multidisciplinary care is often limited. This case report narrates the diagnostic complexities and therapeutic limitations encountered in the evaluation of HSP within a resource-constrained clinical setting.

CASE REPORT

A 37-year-old male with no previous medical history was admitted with progressive bilateral lower limb weakness that began five years ago and was initially more pronounced in the proximal left lower limb. He had mild mental retardation and was

forgetful, the patient's IQ was below optimum. There was no family history of the illness.

On neurologic examination, a minimally spastic gait was found, along with bilateral lower limb spasticity and bilateral extensor plantar reflex; bilateral motor testing showed a brisk reflex in the lower limbs. There was bilateral diffuse hyperreflexia in the lower limbs, along with the Hoffmans and Romberg signs. The sensory system showed intact touch, pain, and temperature sensations along with proprioception, indicating no involvement of the bladder or bowel. The neurologic evaluation was within normal limits for the remainder of it. Magnetic Resonance Imaging (MRI) of the brain and spinal cord was performed as part of the patient's neuroradiological assessment. MRI shows marked thinning of the corpus callosum (Figure 4). T1 weighted axial MRI shows the hypointense signal at the tips of the frontal horns of the lateral ventricles having a triangular shape (Figure 2). The patient's first visit to our institution was in March 2019 and has since been managed with supportive therapy aimed at alleviating muscle spasms. The patient has remained compliant with treatment, and no adverse effects related to the prescribed medications have been reported. Despite adherence to therapy, the clinical course has been marked by progressive deterioration, with no signs of disease stabilization observed up to the last follow-up in July 2022.

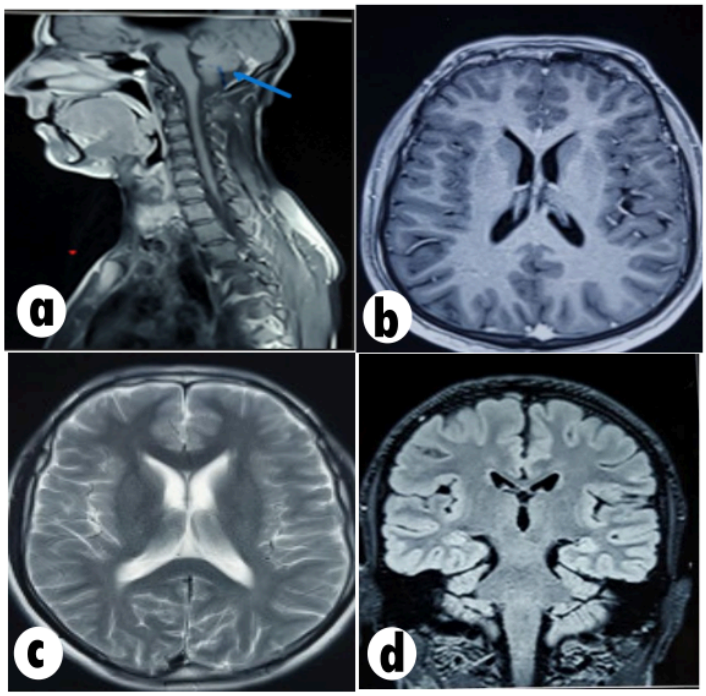

Figure 1: Sequences focused on the spine: (a) sagittal T1 show atrophy on the area marked (b) T1 axial view shows thinning of the frontal horn of the lateral ventricles, (c) T2 weighted axial view shows the hypointense signal at the tips of the frontal horns of the lateral ventricles at the same level shows corresponding hyperintense signal, (d) Coronal view shows a marked thinning of the corpus callosum on the area marked.

DISCUSSION

Hereditary Spastic Paraplegia (HSP) comprises a group of genetically heterogeneous neurodegenerative disorders characterized by progressive multisystem degeneration. Magnetic resonance imaging (MRI) findings in patients with HSP are variable. In many cases, MRI appears normal or demonstrates nonspecific changes. However, certain patients may exhibit distinct abnormalities, the most frequently observed being cerebral and spinal cord atrophy, as well as white matter abnormalities—particularly in the centrum semiovale and corona radiata(4,5).

The imaging findings vary among different phenotypes and in different stages of the disease, as some may be abnormal in some cases. Furthermore, the axonal degeneration is due to different degrees of genetic penetrance among families. Collaborative efforts involving experienced neurologists and neurogeneticists are essential for developing standardized guidelines for genetic screening. The significance of such screening was illustrated by an Alberta cohort study, in which a number of patients with HSP were first misdiagnosed as having cerebral palsy(6).

While it is generally agreed that guideline implementation has a positive influence, for those guidelines to be successfully implemented some criteria must be satisfied: they must be applicable to the specific environment, based on factors such as availability and cost of required resources, specialized skills, population needs and values. Saputra & Kumar et al.,(7) identified the challenges and controversies in genetics testing which includes: (i) the large number of genes involved and the rapid rate of gene discovery; (ii) major phenotypic overlap between HSP and other disorders; and (iii) disorders that mimic HSP. These pose a great limitation to LMIC as there are no funds for such testing since most patients cannot afford to pay for such, therefore, the government needs to subsidize it.

A step-by-step analysis of our case appears useful to demonstrate many chronic shortcomings affecting patients' management in Low-Middle Income Countries (LMIC). First, let us consider early genetic testing in infants and the fact that the identification of gene disorder will help save the lives of many patients as treatment and management can commence immediately. According to a study by Caceres V et al.,(8) reports that screening tests are not definitive, and that clinicians must focus on predictive values, discuss diagnostic risks and benefits, provide detailed counseling to the family, and prepare for unexpected findings should there be any anomaly.

In extending discussion on the limitations of genetic testing in LMICs, Krause et al., (9) broadly looked at epidemiology regarding genetic disease in Africa, which makes it difficult to know which conditions should be prioritized for testing. Nonetheless, genetic tests availability in LMIC is limited to tertiary centers in some countries while some LMIC do not have a testing lab and this represents a practical issue given the uneven distribution, which favors urban centers over rural and remote underserved regions. Fortunately, the increasing accuracy of early genetic testing that can detect defective genes in neonates majorly in developed countries is gradually becoming an acceptable option for baseline diagnosis as shown in our case (10).

In LMIC the scarcity of genetic testing labs for diagnostics can be partly explained by the lack of equipment and skillset. Although there may be different treatment options available for HSP, the primary focus of therapies is on symptom management (10). As there is no cure for HSP, physical therapy and stretching can help maintain mobility and range of motion. Medications such as baclofen, tizanidine, and benzodiazepines may reduce spasticity but can cause side effects such as drowsiness and weakness (11).Botulinum toxin injections provide temporary relief from spasticity, but repeated injections may lead to immunity. Surgical procedures are risky and offer a few lasting benefits. Although these treatment options can be helpful, the progressive nature of HSP and its potential side effects highlights the need for safe alternative therapies. Although current medical techniques aid in the diagnosis and management of the disease, current symptomatic treatments fall short of expectations Dukhovny S et al (12) agrees to increasing numbers of prenatal and perinatal treatment available in developed countries. As more in utero therapies are developed, the detection of disorders that are amenable to, and would benefit from, prenatal or immediate neonatal targeted therapy will increasingly be a focus of prenatal testing. Prenatal genetic testing must also balance the ethical principles of autonomy and distributive justice.[12]

Prenatal genetic testing has evolved considerably over the past decades, and new tests are being introduced into the prenatal setting at a rapid pace. This introduction has often occurred without input from professional organizations, and with inadequate provider and patient education. With this in mind, the Society for Maternal-Fetal Medicine, the American College of Obstetricians and Gynaecologists, and the American College of Genetics and Genomics convened a workshop with three primary objectives: (1) to create a framework for introduction of new genetic tests into clinical use; (2) to outline the criteria for providing genetic counselling and consent for genetic testing from a provider perspective; and (3) to create clear and consistent guidelines for use of existing prenatal genetic tests. After clear understanding of the importance of genetic testing the United Arab Emirates' Ministry of Health and Prevention (MoHAP) has introduced mandatory genetic testing in premarital screening to safeguard public health and improve the well-being of future generations starting from January 2025 to help prevent genetic disorders. One might argue that treating genetic diseases is costly and requires long-term medical care, including hospitalizations, medications, and therapies. But having genetic testing helps to identify carriers of inherited conditions early in order to prevent genetic diseases such as HSP and others from happening (13).

Finally, the points listed above about the diagnostic and management of HSP draw the conclusion that the most important investment to improve outcome of these neurological patients would be in projects

aimed at fulfilling the specialist workforce which remains inadequate in quantity, disproportionate in distribution, and ineffective in LMIC and most importantly collaborations with other specialist in the managements of HSP patients for better treatment outcome.

Conclusion

Genetic testing should be a top priority for governments as a basic health policy during pregnancy and infancy, given the importance of early diagnosis in improving outcomes for pediatric children with hereditary spastic paraplegia (HSP). After ruling out more evident explanations, any patient exhibiting a persistent, increasing pyramidal syndrome of the lower limbs should have their suspicions about HSP raised. Early genetic screening would enable prompt intervention and rehabilitation strategies aimed at maintaining patient mobility and quality of life, given that the characteristics of HSP in children differ significantly from those in adults, especially in terms of etiology, evolution, and outcomes. The discovery of genetic mutation causing corticospinal tract degeneration is essential to the final diagnosis of HSP. In tertiary hospitals, pediatric patients can receive specialised and standardised care, thus their management should be concentrated there due to their longer life expectancy.Regardless of geographic location, healthcare systems must aim to deliver uniform, high-quality care in order to guarantee treatment fairness.

Furthermore, maintaining cooperation between the worldwide neurological and genomic research communities is necessary to overcome global inequities in the care of HSP, particularly in low- and middle-income countries (LMICs). Research should continue to concentrate on improving therapeutic approaches, increasing access to genetic tests, and lowering healthcare disparities that impede the best possible patient care. Through the incorporation of genetic testing into national healthcare policies and the development of international scientific collaborations, governments can greatly enhance the quality of life and long-term results for children with HSP.

Credit authorship contribution statement: Emeka Alfred Clement – Conceptualization, Validation, Visualization, Methodology, and Writing Original Draft. Wafa Regragui – Review, Editing, Supervision and Validation.

Protection of human and animal subjects: The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent: The authors have obtained the written informed consent of the patients or subjects mentioned in the article.

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

Funding: None

REFERENCES

1. Bellofatto M, De Michele G, Iovino A, Filla A, Santorelli FM. Management of hereditary spastic paraplegia: a systematic review of the literature. Front Neurol. 2019;10:
2. Priya S, Siddique N, Das R, Singh A. Multiparametric 3T MRI evaluation of hereditary spastic paraplegia: a case report. Indian Journal of Radiology and Imaging. 2016 Jul;26(03):328-31.
3. Coutinho P, Barros J, Zemmouri R, Guimarães J, Alves C, Chorão R, Lourenço E, Ribeiro P, Loureiro JL, Santos JV, Hamri A. Clinical heterogeneity of autosomal recessive spastic paraplegias: analysis of 106 patients in 46 families. Archives of neurology. 1999 Aug 1;56(8):943-9.
4. Reid E. The hereditary spastic paraplegias. J Neurol 1999;246:995-1003.
5. Reid E. The hereditary spastic paraplegias. J Neurol 1999;246:995-1003.
6. Suchowersky O, Ashtiani S, Au PY, McLeod S, Estiar MA, Gan-Or Z, Rouleau GA. Hereditary spastic paraplegia initially diagnosed as cerebral palsy. Clinical Parkinsonism & Related Disorders. 2021 Jan 1;5:100114.
7. Saputra L, Kumar KR. Challenges and controversies in the genetic diagnosis of hereditary spastic paraplegia. Curr Neurol Neurosci Rep. 2021;21:1–15.
8. Caceres V, Murray T, Myers C, Parbhoo K. Prenatal genetic testing and screening: a focused review. Semin Pediatr Neurol. 2022;42:100976
9. Krause A. New genetic testing technologies: advantages and limitations. S Afr Med J. 2019;109(4):207–9.
10. Carroll J, Wigby K, Murray S. Genetic testing strategies in the newborn. J Perinatol. 2020;40(7):1007–16.
11. Meshcheriakova A, Konovalova Z, Orlova O, Krasavina D, Yakovleva P, Artemyev D. IncobotulinumtoxinA Treatment For Hereditary Spastic Paraplegia: A Case Report. Toxicon. 2024 Jan 1;237:107458.
12. Dukhovny S, Norton ME. What are the goals of prenatal genetic testing?. InSeminars in perinatology 2018 Aug 1 (Vol. 42, No. 5, pp. 270-274). WB Saunders.
13. UAE Ministry of Health and Prevention. MOHAP announces mandatory genetic testing as part of premarital screening for Emiratis starting early January 2025 [Internet]. Dubai: MOHAP; 2025 [cited 2025 May 29]. Available from: https://mohap.gov.ae/en/w/mohap-announces-mandatory-genetic-testing-as-part-of-premarital-screening-for-emiratis-starting-early-january-2025