VIDEO NEUROIMAGES

Criss-cross gait

A clue to glucose transporter type 1 deficiency syndrome

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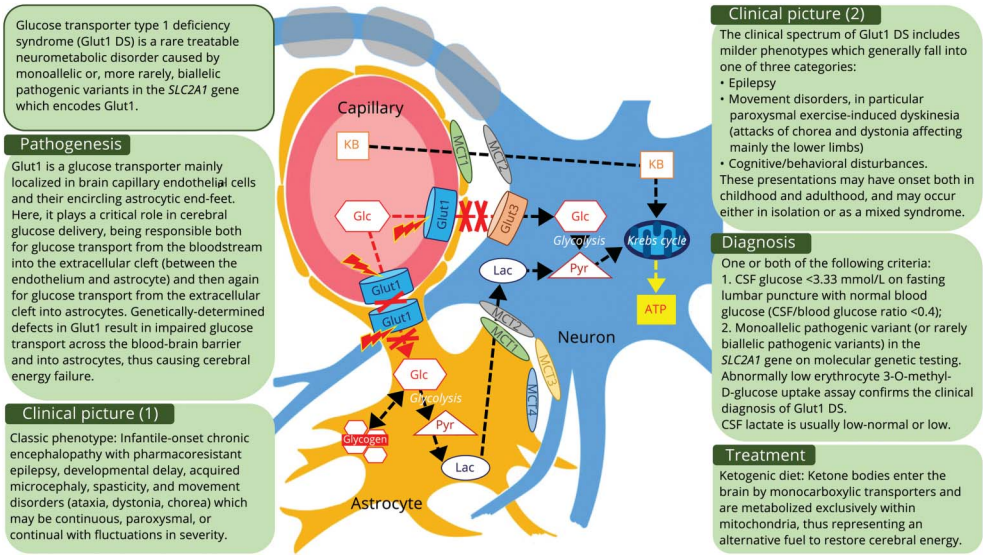
Figure Overview of the pathogenesis, phenotypes, diagnosis, and treatment of glucose transporter type 1 deficiency syndrome (Glut1 DS)



Red dashed lines indicate defective pathways in Glut1 DS. ATP = adenosine triphosphate; Glc = glucose; Glut = glucose transporter; KB = ketone bodies; Lac = lactate; MCT = monocarboxylic transporter; Pyr = pyruvate.

Nearly 90% of patients with glucose transporter type 1 deficiency syndrome (Glut1 DS; figure) have paroxysmal or constant gait abnormalities, including ataxic, spastic, ataxic-spastic, and dystonic gait.[1,2] We report 3 cases of genetically proven Glut1 DS (table) demonstrating a distinctive paroxysmal gait disorder triggered by exertion or fasting, herein named "criss-cross gait" (video 1). It is characterized by lower-body choreo-dyskinesia causing the legs to intersect repeatedly, producing irregular, random steps combined with some loss of balance. Compensatory upper-body movements help maintain balance. In the appropriate clinical context, criss-cross gait should prompt evaluation for the treatable Glut1 DS and not be misinterpreted as functional.

MORE ONLINE

Video

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Table Clinical and genetic features of 3 patients with genetically confirmed glucose transporter type 1 deficiency syndrome showing the criss-cross gait (video 1)

	Case 1	Case 2	Case 3
Current age, y	54	25	24
Sex	Female	Male	Female
Ethnicity	White British	White British	Germanic
Age at onset	6 y	5 y	11 mo
Clinical picture	PED (episodes of toe curling, foot dystonia, limb choreoathetosis)	PED (episodes of foot dystonia, jerky choreiform movements in limbs), episodes of slurred speech	Motor development delay, atypical absence epilepsy, PED (episodes of "wobbly gait"), mild intellectual disability
Family history	Father: history of paroxysmal dystonic choreoathetosis, possibly affected (retrospectively); son affected	Father affected	Negative (de novo mutation)
CSF analysis	Not performed	CSF glucose = 1.9 mmol/L (with blood glucose = 6.8 mmol/L), CSF/blood glucose ratio = 0.28	Not available
Genetic testing *SLC2A1* (ENST00000426263)	Heterozygous variant c.601T>C (p.Cys201Arg)	Heterozygous variant c.278G>A (p.Arg93Gln)	Heterozygous variant c.998G>A (p.Arg333Gln)
Treatment and follow-up	Patient declined to start ketogenic diet; overall reduction in the intensity and frequency of paroxysmal symptoms with age over a 20-year follow-up	Ketogenic diet since age 6 with marked improvement of symptoms; episodes characterized by mild twitching in feet, difficulty concentrating, and slurred speech may occur in relation to occasional dietary indiscretions	Ketogenic diet since age 12 with low adherence; mild constant gait unsteadiness and occasional paroxysmal worsening of gait disturbance over a 12-year follow-up

Abbreviation: PED = paroxysmal exercise-induced dyskinesia.

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Name	Location	Contribution
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Eoin Mulroy, MD, FRACP	UCL Queen Square Institute of Neurology, University College London, UK	Designed and conceptualized study, major role in the acquisition of data, revised the manuscript for intellectual content
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Kailash P. Bhatia, MD, DM, FRCP	UCL Queen Square Institute of Neurology, University College London, UK	Design and conceptualized study, major role in the acquisition of data, revised the manuscript for intellectual content

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