Case Report

Fully Functional Recovery after Brainstem Infarction in a Young Patient- A Case Report

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Abstract

Ischemic brainstem infarction is extremely rare in the young people under 30 years old but with severe symptoms and poor prognosis. It is commonly caused by stenosis and occlusion of the vertebrobasilar artery and its branch vessels. Here we reported a 26-year old male brainstem infarction patient with severe hemiplegia and dizziness on admission. He has no hypertension, obesity, diabetes and other chronic diseases, which are the most common reasons for infarction, but has a long history for smoking and drinking. Immediately after acute drug therapy for circulation improvement, he received personalized treatment with drug medication plus physical rehabilitation. The myodynamia, motor balance and living ability fully recovered 5 months later. This case leads us to call for more attention to brainstem infarction patient younger than 30 years in the hope for new strategies for both diagnosing and treatment.

Introduction

Ischemic stroke accounts for 85% of all strokes. It is one of the most common cerebrovascular diseases and characterized by high incidence, morbidity, and mortality [1-2]. Stroke has become the major cause of disability and the second leading cause of death in the world [3]. Stroke in people younger than 45 years is less frequent than in older people but has major impact on the individual and society. Due to various factors, the proportion of stroke in adolescents and young adults (aged from 18-50) has increased to approximately 15%-18% in recent years [4,5]. Patients in this age are almost in a critical period of life when important decisions should be made on starting a family or a career. It also remain at high risk for recurrence [6]. Therefore, close attention should be made for the therapy of young patients and the functional recovery is urgently required. Ischemic brainstem strokes constitute about 10% of all ischemic brain strokes. Patients with brainstem strokes may experience minimal functional or cognitive deficits, or devastating injury. A patient under 30 years old and with severe motor deficits after brainstem infarction could fully functional recovered is extremely infrequent. We outline the patient's hospital course and eventual improvement here is for calling more attention to brainstem stroke in young.

Case Presentation

A 26-year old man with sudden right-sided hemiplegia and dizziness was admitted to hospital. On admission, he was diagnosed with brainstem infarction based on the image of CT scan and extremely high level of

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Table 1: Personalized Rehabilitation Training Strategy

Drug Medication	Butylphthalide	0.2 g, t.i.d.
	Folic acid	0.8 mg, q.d.
	Mecobalamin	0.5 g, t.i.d.
Physical Rehabilitation	Acupuncture	q.d.
	Electronic biofeedback	q.d.
	Hand function training	q.d.
	Hemiplegic limb comprehensive training	b.i.d.
	Balance function training	b.i.d.
	Endurance training	b.i.d.

Table 2: Brunnstrom stage, Berg Balance Scale and Barthel Index

Evaluation Period	Brunnstrom stage			Berg Balance Scale	Barthel Index
	Upper Limbs	Hand	Lower Limbs		
On admission	II	II	III	29	55
50 days after	III	III	III	33	60
120 days after	V	V	V	44	85

homocysteine (71 μmol/L). He denied for the history of hypertension, diabetes, coronary heart disease or other chronic disorders and felt perfectly well before the symptoms occurred. He has been smoking for over 8 years with 10-15 cigarettes per day and drinking 4 to 6 bottles of beer daily for over 7 years. Physical examination showed the lower myodynamia on right arm and leg. Muscle tension of right limb was normal. He lost balance when made a move and the ability of daily life decreased dramatically (was in moderately dependent). No cognitive deficit was noticed and all the reflex were normal. After admission, he received 12 days treatment with anticoagulants, vasodilator and neuroprotective agents to improve the circulation and enhance collateral circulation establishment. As soon as finishing the acute treatment, function rehabilitation training was admitted (Table 1). The initial treatment effect was noticed by Brunnstrom stage 20 days later and the decrease of homocysteine level (59 μmol/L) was observed 3 months later. Five months later, the myodynamia of right limb, the balance (showed by Brunnstrom stage and Berg Balance Scale, Table 2 and supplement) basically recovered to normal levels. The ability of daily living (showed by Barthel Index, Table 2 and supplement) recovered to almost independent. The homocysteine level reversed to 27 μmol/L.

Discussion

Stroke patients younger than 50 may have etiology varies [7]. According to the traditional TOAST classification of stroke, the patient we reported here could be classified as stroke of undetermined etiology [8]. Based on the risk factor classification given by International Pediatric Stroke Center [9-11], the long history of excessive alcohol consumption and cigarettes smoking might be the main etiology for this 26-year old ischemic brainstem stroke patient. In addition, existed data showed that hyperhomocysteinemia may be risky for ischemic stroke [12-13]. Accordingly, we noticed the homocysteine level of this patient is far beyond the normal value (0-20 μmol/L) and the treatment with folic acid tablets and methylcobalamin capsules was quite successful. The treatment of brainstem infarction mostly relies on drugs and works poorly in most cases. For stroke in young, function recovery is critically required. Therefore, a personalized rehabilitation training was given to this patient immediately after acute treatment and last for 4.5 months [14-17]. An optimistic result, including the regain of postural balance and ability of daily life as well as the reverse of homocysteine level was achieved. In summary, stroke in young patient requires different approach to investigate and management. The recovery from stroke in young patient is quicker and better than that for older adults. To our knowledge, this is the first report of ischemic brainstem stroke in patient younger than 30 years. Our experience leads us to call for more cases and new strategies for diagnosing and treatment of stroke in lower age.

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Disclosure

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Table S1: Brunnstrom stage

Phase	Upper limb	Hand	Lower limbs	Functional rating
1	No movement at all.	No movement at all.	No movement at all.	I
2	Only cooperative movement patterns were observed.	Only slight flexion and extension.	There was only minimal voluntary movement.	II
3	Co-movement can be initiated at will.	A hook grip can be made, but the fingers cannot be extended.	In the sitting and standing positions, there is collaborative flexion of the hip, knee, and ankle.	III
4	The appearance of activity that is detached from the co-movement. Forearm pronation and supination with shoulder 0 degree elbow flexion 90 degrees. Elbow straight shoulder flexion 90 degrees. The lumbosacral region was palpable on the back of the hand.	It can pinch and loosen the thumb laterally, and the fingers have a small range of semi-random extension.	More than 90 degrees of knee flexion in the sitting position, can make the foot slide to the bottom of the chair, in the case of heel from the ground can make ankle dorsiflexion.	IV
5	There were relatively independent cooperative movements. Shoulder abduction at 90 degrees with elbow straight. Forearm pronation and supination during shoulder flexion from 30 degrees to 90 degrees with elbow straight. The elbow is straight and the forearm is in the middle position, and the upper limb is raised over the head.	Both spherical and cylindrical grips can be made, with the fingers extended simultaneously but not individually.	Healthy leg stand, the affected limb can first bend the knee and then extend the hip, and do ankle dorsiflexion under the knee extension (the center of gravity falls on the healthy leg).	V
6	The motor coordination was close to normal, and the distance between fingers and nose was not obvious, but the speed was slower than that of the healthy side (< 5 seconds).	All grips could be completed, but the speed and accuracy were worse than those of the healthy side.	The hip can be abducted in a standing position beyond the range that can be reached by lifting the pelvis on that side. In the sitting position, the knee can be extended and internal rotation of the lower limbs, which can complete the varus and valgus of the combined foot.	VI

Table S2: Berg Balance Scale

Project	Completion	Project	Completion	Project	Completion
1. Rise from a sitting position	4= Able to stand up and maintain stability independently without using hands	6. Close the stand	4= Able to stand safely for 10 seconds	11. Turn 360 degrees	4= Make a safe 360 degrees turn in 4 seconds
	3= Can stand up independently with hand support		3= Able to stand safely for 10 seconds under supervision		3= Can safely turn 360 degrees in only one direction in 4 seconds
	2= After several attempts, stand up on hands		2= Can stand for 3 seconds		2= Able to safely turn 360 degrees but move slowly
	1= Need a little help to stand up or hold steady		1= Unable to close eyes for 3 seconds, but stable standing		1= Close monitoring or verbal prompting is required
	0= Need more than a little help to stand up or hold steady		0= It takes two people to keep from falling		0= Need help turning around

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2. No support standing		7. Stand with your feet together		12. Stand with one foot on a step or stool	
	4= Able to stand safely for 2 minutes		4= Able to stand securely with feet together independently for 1 minute		4= Able to stand safely and independently and complete 8 reps in 20 seconds
	3= Able to remain standing for 2 minutes under supervision		3= Able to stand independently with feet together and under supervision for 1 minute		3= Able to stand up for 8 times over 20 seconds
	2= Able to remain standing for 30 seconds under supported conditions		2= Able to bring feet together independently, but not for 30 seconds		2= Can be completed 4 times without assistance under supervision
	1= It takes several attempts to stand unsupported for up to 30 seconds		1= Stand with feet together for 15 seconds		1= Can be completed > 2 times with little help
	0= Cannot stand for 30 seconds without assistance		0= Need help to stand with feet together and can't hold for 15 seconds		0= Need help to prevent falling or being unable to do it at all
3. No supporting seat		8. In the standing position, extend the upper limb forward and move forward		13. Stand with one foot in front of the other	
	4= Able to safely remain seated for 2 minutes		4= Able to extend forward > 25cm		4= Able to position your feet in front of each other for 30 seconds without spacing
	3= Able to remain seated for 2 minutes under supervision		3= Can safely extend forward > 12cm		3= Able to position your feet in front of you and behind you for 30 seconds independently
	2= Can sit for 30 seconds		2= Can safely extend forward > 5cm		2= Able to take small, independent steps and hold them for 30 seconds
	1= Can sit for 10 seconds		1= Upper limbs may protrude forward but will require monitoring		1= Step forward needs help, but can hold for 15 seconds
	0= Can't sit for 10 seconds without back support		0= Losing balance or needing external support while stretching forward		0= Lose balance while stepping or standing
4. Sit from a standing position		9. Pick up items from the ground while standing		14. Stand on one leg	
	4= Use minimal hand help to sit down safely		4= Able to accomplish tasks easily and safely		4= Able to raise legs independently and hold for > 10 seconds
	3= With the help of both hands can control the body's descent		3= It can be done but requires monitoring		3= Able to raise legs independently and hold for 5-10 seconds
	2= Use the back of lower legs against the chair to control descent		2= Reach down 2-5cm and balance independently, but cannot complete the task		2= Able to raise legs independently and hold for 3 seconds or more
	1= Sit independently, but do not control body descent		1= Trying to reach down to pick up an object requires monitoring, but still can't complete the task		1= Attempt to lift the leg, unable to hold for 3 seconds, but able to maintain independent standing
	0= Need help sitting down		0= Do not try to reach down to pick up objects or need help to avoid losing your balance or falling		0= Unable to lift legs or need help in case of a fall

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5. Transfer	4= It can be safely transferred with a little hand support	10. Turn and look back in a standing position	4= Can see from side to side and back, good body transfer		
	3= It is absolutely necessary to use your hand to transfer it safely		3= Looking back only from one side, the other side has poor body transfer		
	2= Verbal instructions or supervision are required for transfer		2= Can only turn to the side, but the body balance can be maintained		
	1= Need the help of one person to move		1= Need monitoring when you turn around		
	0= To be safe, two people are needed to help or supervise the transfer		0= Need help in case you lose your balance or fall		

Note: 0-20 points: poor balance function, the patient needs a wheelchair. 21-40 points: a certain balance ability, the patient can walk with assistance. 41-56: balance function is good, the patient can walk. < 40: Risk of falling.

Table S3: Barthel Index

Project	Scoring criteria	Project	Scoring criteria
Have a meal	0= Rely on others	To move bowels	0= Incontinence or coma
	5= Need some help (cutting bread, buttering, picking up the dishes, filling the rice)		5= Occasional incontinence (< 1 time per week)
	10= Comprehensive self-care		10= Can control
Take a shower	0= Rely on	To urinate	0= Incontinence or coma or catheterization by another person
	5= Provide for oneself		5= Occasional incontinence (< 1 every 24 hours, > 1 per week)
			10= Can control
Modified	0= Need help	Use the toilet	0= Rely on others
	5= Wash your face, comb your hair, brush your teeth, and shave independently		5= Partial help Needed
			10= Provide for oneself
Dress	0= Rely on others	Activity (walking) (in and around the ward, excluding distance walking)	0= Can't move
	5= Need half the help		5= Independent mobility in a wheelchair
	10= Provide for oneself (fasten buttons, switch zippers and put on shoes)		10= Need 1 person to help you walk (physical or verbal) 15= Independent walking (with assist)
Transfer (bed-chair)	0= Totally dependent on others, can't sit	Go up the stairs (up and down a flight of stairs with a cane counts as independent)	0= Can't move
	5= Lots of help needed (2 people), can sit		5= Need help
	10= Need a little help (1 person) or guidance		10= Provide for oneself(physical or verbal)
	15= Provide for oneself		

Notes: Scores represent the degree of activities of daily living (ADL) capability deficit. 0-20= Very severe functional defect. 25-45= Severe functional defect. 50-70= Moderate functional deficits. 75-95= Mild functional deficits. 100= Provide for oneself.

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