Case Report

Neurological Recovery of Upper Extremity in Stroke Woman after 5 Years: A Case Report

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Strokes are common neurological disorders in Thailand. Rehabilitation programs significantly improve arm function outcomes if performed during the sub-acute period of stroke rehabilitation, within 6 months of the attack.

This report describes the case of a stroke patient who gained upper extremity motor recovery after 5 years, which is beyond the normal recovery period. Although the patient does not have functionality, she has partial motor recovery, and she is enthusiastic about learning to gain better use of her hand. However, there is still limited evidence to use in designing effective intervention and proper timing of rehabilitation administered by personnel in training chronic stroke patients. Therefore, evidence based on neuroplasticity and neurological recovery in chronic stroke patients, including rehabilitation intervention, is presented in this report.

Keywords: *Neurological recovery, Upper extremity, Stroke*

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Strokes are common neurological disorders in Thailand. They affect patients in various ways such as health expense, functionality, and psychosocial problems. In 1999, strokes were the third most common cause of Disability-Adjusted Life Years (DALYs) in Thai males and ranked the second most prevalent cause of DALYs in the Thai female population[1]. In 2012, the number of new cases of stroke in Thailand (excluding Bangkok) was 20,675 patients, which is equivalent to 32.17 patients per 100,000 population. From 1998 to 2012, the number of new cases of stroke was 67,168 cases[2], and approximately 35 percent of stroke survivors were functionally disabled after one year[3]. Clearly, the number of disabled stroke patients is set to increase in the near future.

At present, it is advised that stroke rehabilitation should start in the acute and sub-acute phase in order for patients to regain motor recovery, which mostly improves in the first month and gradually continues to progress for up to 6 months[4].

Wade et al showed that acute stroke patients with non-functioning upper extremity significantly improved arm and hand function within three months. At 2 years after stroke, 39% of non-functional arms had achieved some recovery, and 14% of these had attained complete recovery[5]. A systematic review[4] also found that for stroke survivors with initial paralysis, complete recovery occurred in less than 15% of cases, in both upper and lower extremities. Rehabilitation programs significantly improve arm function outcomes if performed during the sub-acute stroke rehabilitation period within 6 months of the onset[6]. Constraint-induced movement therapy, electromyographic biofeedback, mental practice and robot-assisted therapy are the interventions which show promise for improving the recovery of arm function; however, none of these interventions shows a consistent pattern of improvement in hand function[7]. Hemiplegic stroke patients with non-functioning upper extremity use the normal side in carrying out their activities of daily living.

Stroke patients who get through rehabilitation with no further motor recovery are usually advised to maintain their rehabilitation program by themselves. Subsequently, they are re-evaluated intermittently and their rehabilitation program is adjusted if their motor impairment or functions have changed.

This report aims to describe the case of a stroke patient who regained upper extremity motor recovery in the chronic stage. Survivors of chronic stage stroke are left with few options for effective intervention to improve motor recovery and function.

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There is still limited evidence to assist in providing effective intervention and proper timing of rehabilitation by personnel in training chronic stroke patients (patients whose stroke occurred more than 6 months in the past). Stroke patients have varieties of symptoms depending on type of stroke, lesion location, area of brain pathology, and timing of recovery. At present, little guidance exists with regard to which intervention is most suitable for individual patients or even the optimal period of rehabilitation intervention required to strengthen neurological recovery[8-10].

Case Report

A 60-year-old Thai female patient had underlying dyslipidemia. She was previously healthy with functional independence and worked as a homemaker.

Five years ago (11 November 2009), the patient came to Rajavithi Hospital complaining of right side weakness. She was admitted for one week and was then lost to follow-up.

On 16 April 2010, five months after the initial weakness, she came back to the Rehabilitation Department. She still had right side weakness, with power of lower extremity grade 3 and ankle dorsiflexion grade 1. Her power of right upper extremity was grade 1, and finger flexor and extensor was grade 0. She could ambulate with a tri-pod cane and plastic ankle-foot orthosis without supervision. She could perform activities of daily living independently with her left arm, except for bathing which she performed with the help of her husband. At that time, she developed depression and was treated with fluoxetine (20 mg) daily.

Four and a half years ago (29 April 2010), the patient was readmitted due to left hemiparesis and had full recovery within one day. She was diagnosed with lacunar infarction.

About six months later (3 November 2010), the patient had recurrent stroke with progressive right side weakness. She had good consciousness with motor power of right upper and lower extremities grade 0, and no paresthesia, and CT scan showed hypodensity at left basal ganglion. After three months, she gained her motor recovery and achieved her previous functionality. The patient was given an outpatient rehabilitation program for 10 months, and was re-evaluated on 5 September 2011.

Physical examination:

Good consciousness, not pale.

Motor Lt side grade V.

Rt. side grade II at arm, grade 0 at hand. Full passive range of motion of upper extremities.

Spasticity: Modified Ashworth Scale (MAS) 2/4 Rt. upper extremity.

Brunnstrom stage of recovery 3/6 Rt. upper extremity.

Hand function Rt: could not perform grasp and release, spastic MAS 3/4 at finger flexor.

Rehabilitation Assessment:

Gait: ambulated with tripod cane with Rt. plastic AFO, hip hiking Rt. side.

ADL: independent in eating, grooming, toileting, dressing. Partially dependent in bathing.

Mood: depressed face for some time, but smiling more than at her previous appointment.

Language: no aphasia

Bowel and bladder: continent.

Medication: ASA (325) 1*1, Folic acid 1*1, Fluoxetine 1*2, Enalapril (5) 1*1, Clonazepam (2) 1*1

A rehabilitation program was encouraged to be maintained at home because she had reached her goal and her neurological condition had not changed for at least 6 months. At that time, she had functional independence with good support from her husband, and her depression had considerably abated.

On 13 October 2014, the patient came back to the Rehabilitation Department, as she felt some change in her right hand, with which she had been able to grasp for 2 months. Physical examination found:

Rt. upper extremity: power at arm grade 3, Brunnstrom stage of recovery 4/6.

Rt. hand function: mass grasp, could not release. Spastic MAS 3/4 at elbow flexor and 3/4 at finger flexor.

Gait: hip hiking with arm abduct and flexion (Fig. 1)

Discussion

This case report illustrates the spontaneous neurological recovery of a stroke patient after 5 years, without additional intervention or medication. Although her right hand is still non-functional, she has partial motor recovery, and she is enthusiastic about learning to gain more use of her right hand. Therefore, a rehabilitation program has been developed with the limited evidence available to help this chronic stroke patient.

The patient had poor motor recovery of the upper extremity, with spasticity and non-functionality. This is compatible with the findings of Shelton et al[11] which showed that motor recovery of the upper extremity declined progressively with the involvement

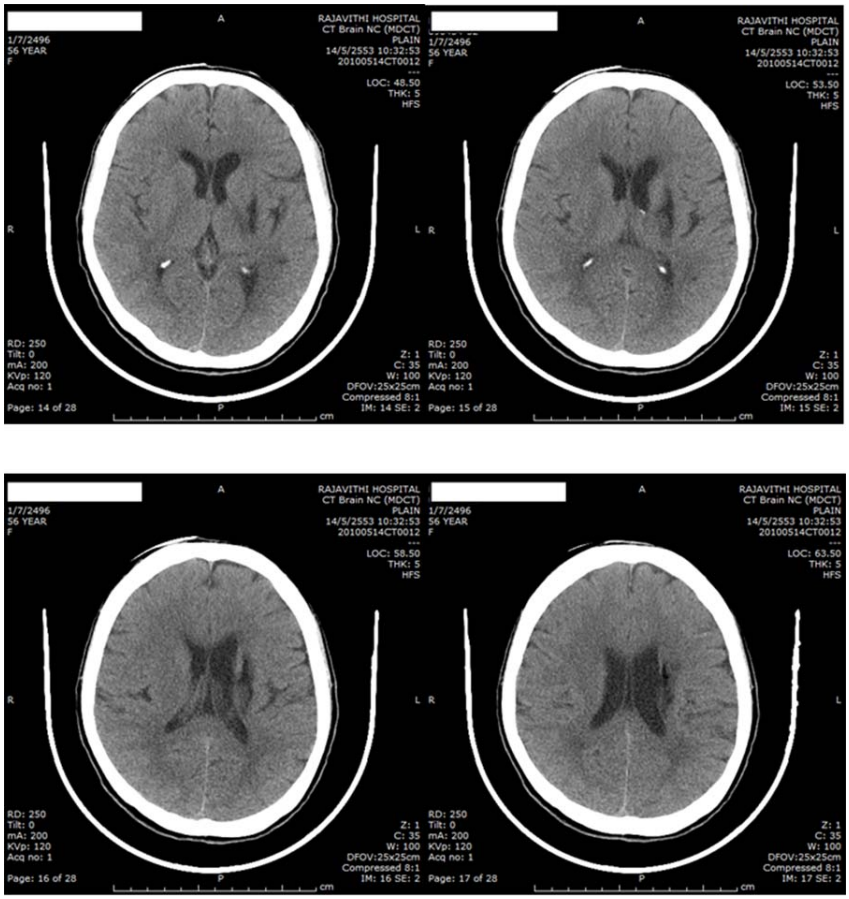

Fig. 1 CT of the brain (14/5/2010) revealed small, well-defined hypodense areas of old infarction involving left basal ganglia (posterior limb, internal capsule, external capsule).

Table 1. Right upper extremity evaluation from 2010-2014

Date	Brunnstrom	Proximal upper extremity		Distal Upper Extremity			
		Power	MAS	Power	MAS	Grasp	Release
11/11/1009: first ischemic stroke attack							
16/4/2010 (5 months)*	-	1+	-	0	-	x	x
3/11/2010 (1 year)* (second episode of Rt hemiparesis)	-	0	-	0	-	x	x
5/9/2011 (1 year 10 months)*	3	2	2	0	3	x	x
13/10/2014 (4 years 11 months)*	4	3	3	2	3	✓	x

* Time after first onset of stroke

of corona radiata and the posterior limb of the internal capsule (PLIC), and that recovery was best in patients who had purely cortical involvement. Stroke patients with subcortical involvement tended to have poor motor recovery because the subcortical area is associated with the primary motor corticospinal tract. Fibers from the primary motor cortex of upper limb contributing to the corticospinal tract converge in the

posterior half of the middle third of the corona radiata before entering the PLIC[11]. A study by Page et al[12] found that there was no relationship between the lesion volume and upper extremity impairment and functional outcomes. Relatively small lesions which affect major tracts such as corticospinal projection are associated with poorer recovery and might produce larger deficits than more superficial lesions of similar volume[12].

Nowadays, neuroplasticity[13,14] is another important factor for predicting spontaneous neurological recovery and the possibility of developing rehabilitation interventions in chronic stroke patients. The brain is capable of reorganization to recover loss of function, and neuroplasticity has been widely studied to explain this phenomenon. In normal situations, the brain is excited and inhibited to keep balance in its function. Under abnormal circumstances, there are ongoing processes in brain reorganization such as changes in neuronal membrane excitability and synaptic remodeling. Therefore, previously inhibited brain areas can achieve functionality and plasticity by forming new neural formations, which can facilitate recovery of the remote brain area from lesions. The principles of neuroplasticity suggest it would be possible to improve spontaneous recovery.

A study by Stiner et al[15] used transcranial magnetic stimulation (TMS) and functional MRI to evaluate the functional integrity of the corticospinal tracts. The study illustrated that contralesional brain activity is associated with movement of the affected hand when the ipsilesional brain is severely damaged, but the outcomes remained poor. As Rajavithi Hospital has neither TMS nor fMRI, we were unable to establish which part of the patient's brain is mainly involved in using the affected hand.

It is not clear whether motor rehabilitation intervention and neuroplasticity promote the neural process of spontaneous recovery or the compensatory changes in brain reorganization that not normally occur. Proper timing and a rehabilitation approach targeting the active motor brain area to enhance neuroplasticity are also still not well defined. The evidence supports the view that only constraint-induced movement therapy, which is a task-oriented approach, helps to improve affected upper limb function in chronic stroke patients[8].

Conclusion

This case report described a patient who gained spontaneous, partial, upper extremity motor recovery after 5 years, which is outside the normal recovery period. Therefore, details of other cases of chronic stroke patients who regained motor recovery after 6 months should be collected and studied in order to deepen our knowledge of this disease. An understanding of factors related to motor and cognition recovery is also important in order to enable a rehabilitation protocol to be put in place to enhance patient function when possible. Further study is required of rehabilitation programs for chronic stroke patients to promote their functionality and quality of life.

What does this study adds ?

This case report will present chronic stroke patients with the chance to recover their motor traction skills, beyond expectation.

Potential conflict of interest

None.

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ผู้ป่วยหญิงโรคหลอดเลือดสมองที่มีการฟื้นตัวของระบบประสาทสั่งการแขนหลังจาก 5 ปี

ชญานิน เวชภูติ

โรคหลอดเลือดสมองเป็นโรคทางระบบประสาทที่พบได้บ่อยในประเทศไทย การฟื้นฟูผู้ป่วยแนะนำให้ทำในช่วงระยะเฉียบพลันและกึ่งเฉียบพลัน การใช้งานแขนพบว่าได้ผลดีถ้าฝึกในช่วง 6 เดือนแรกหลังจากเกิดโรค ผู้นิพนธ์จึงเสนอรายงานผู้ป่วยโรคหลอดเลือดสมองที่มีการฟื้นตัวของระบบประสาทสั่งการแขน หลังจากเกิดโรคประมาณ 5 ปี ซึ่งพ้นช่วงที่น่าจะมีการฟื้นตัวของระบบประสาท ถึงแม้ผู้ป่วยจะมีการฟื้นตัวแต่ยังมีการทำงานของแขนไม่ดีนัก อย่างไรก็ตามจากหลักฐานวิชาการในปัจจุบันแนวทางการฟื้นฟูผู้ป่วยโรคหลอดเลือดสมองที่เข้าระยะเรื้อรังยังไม่ชัดเจน ดังนั้นรายงานผู้ป่วยฉบับนี้จึงนำเสนอหลักฐานทางวิชาการในด้านการปรับเปลี่ยนการทำงานสมอง และการฟื้นตัวของระบบประสาทสั่งการรวมถึงการฟื้นฟูผู้ป่วยโรคหลอดเลือดสมองในระยะเรื้อรังที่เป็นมานานกว่า 6 เดือน