

## Prevention of recurrence of stroke in a patient with sickle cell disease who has Moyamoya Syndrome

Moyamoya sendromu olan orak hücreli anemi hastasında tekrallayan inmelerin önlenmesi

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### Abstract

Moyamoya syndrome may occur several years after cerebrovascular event in patients with sickle cell disease. This manuscript presents the efforts to prevent recurrence of stroke by using hydroxyurea and red cell exchange therapy after developing early signs of a new neurological attack in a patient with Moyamoya syndrome.

**Keywords:** Moyamoya; sickle cell anemia; stroke; red cell exchange

### Özet

Moyamoya sendromu orak hücreli anemi hastalarında serebrovasküler olaylardan yıllar sonra gelişebilir. Bu çalışmada yeni bir nörolojik atağın öncü işaretleri gelişen ve Moyamoya sendromu olan hastada, hidroksüre ve eritrosit değişimi ile inme oluşmasını önleme çabaları sunulmaktadır.

**Anahtar kelimeler:** Moyamoya; orak hücreli anemi; inme; eritrosit değişimi

### Introduction

Cerebrovascular event is an awful complication of sickle cell disease (SCD) (1). Chronic transfusions are effective in preventing the short-term recurrence of an infarctive stroke (2). After acute stroke in SCD patients, chronic transfusion therapy has been shown to nearly stop progression of stenosis in most cases particularly in pediatric patients (4,5). However, several years after the first attack, large vessel disease may present as Moyamoya syndrome (6). It is expected that treatment with chronic transfusion may also prevent a new cerebral infarction in patients with SCD who developed Moyamoya syndrome. In this article, we describe the results of automatic red cell exchange therapy for prevention of recurrence of stroke in a case of adult SCD with Moyamoya syndrome developing after an infarctive stroke in the pediatric age.

### Case

In December 2012, a 22-year-old woman with SCD was admitted to our hematology service with complaints of weakness, dizziness and bone pain. She had been diagnosed and treated for stroke with right hemiplegia and had been transfused with two units of erythrocyte suspension for anemia and vaso-occlusive crisis thirteen years ago. Subsequently her clinical condition had improved, so the patient has not developed any sickle cell related complication till her last admission except her easily controlled and rare painful crisis. On her

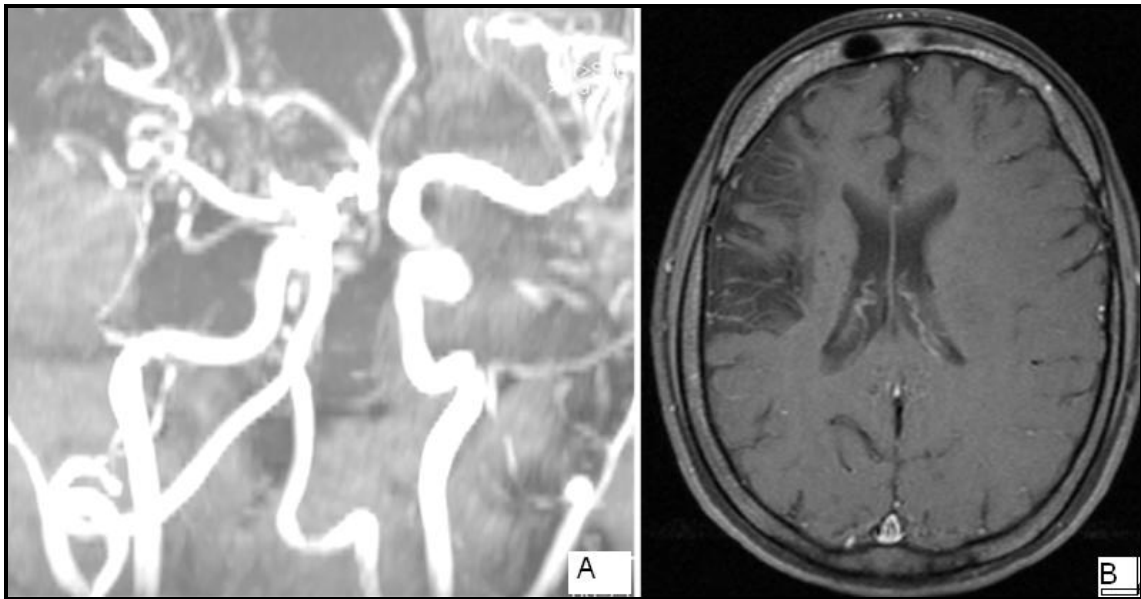
current admission, she reported to have a dizziness which she had experienced like this preceding the first attack. Physical examination revealed pallor, body temperature 36°C, pulse 82/min, respirations 16/min, and blood pressure 120/70 mmHg. Neurological examination revealed a moderate left sided spastic hemiparesis. The patient's peripheral blood smears showed anisocytosis, sickle-shaped erythrocytes and a variety of other misshapen cells, basophilic stippling in erythrocytes, nucleated red blood cells. Serologic tests for antibodies to hepatitis B and C virus, parvovirus B19, cytomegalovirus, Epstein-Barr virus, human immunodeficiency viruses 1 and 2, antinuclear antibodies, p-antineutrophilic cytoplasmic antibodies, antiplatelet antibodies and a direct Coombs' test were negative. To define the changes of regional blood flow at the site of external carotid artery and vertebral artery to guide the preventive treatment of symptomatic hypoperfusion a pulsed doppler ultrasonographic examination showed normal findings. A cerebral angiography revealed steno-occlusive change not only in the internal carotid artery (ICA) but also in the posterior cerebral artery (PCA). Diffusion-weighted magnetic resonance (MR) imaging demonstrated no abnormalities (Figure 1A and 1B).

The patient was a student. At the time of admission, she reported that he had not used any drugs consisting of hydroxyurea or been exposed to any known chemicals recently.

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**Figure 1.** 1A The right distal internal carotid artery occlusion is showing on the brain MR angio, 1B axial post gadolinium T1 weighted MR image is showing chronic ischemic findings at right MCA territory area.

Naturally, dizziness was defined as an early warning sign of the second neurological attack and the patient underwent two preventive automatic red cell exchange procedure with three month interval. She ignored to use hydroxyurea because of intolerance problem. Six months after admission, she did not develop any neurological event.

#### **Discussion**

Moyamoya syndrome is characterized by typical angiographic “Moyamoya” changes associated with subsequent clinical features (1,2). In Moyamoya disease, as in other chronic steno-occlusive cerebrovascular diseases, the steno-occlusive change in the main cerebral arteries decreases the cerebral perfusion pressure and collateral circulation maintains cerebral blood flow (8,9). Stroke is a serious complication of SCD. There have been some reports of the association of Moyamoya vasculopathy with SCD. A low level of hemoglobin in SCD causes hypoxia, endothelial activation and microvascular stenosis fascilitate this process.

Patients with SCD have prone to develop thrombosis. The risk of a hypercoagulable state in SCD is multifactorial (including altered platelet function, red blood cell membrane abnormalities leading to activation of the coagulation cascades, and changes in coagulation protein levels). Due to chronic inflammatory state, endothelial activation and vascular damage may also result in arterial perfusion abnormalities. So, the patient was under risk of recurrence of stroke. It is not clear whether restoration of hemoglobin A concentration by apheresis prevent recurrence of stroke.

Although this patient had experienced the symptoms for 9 years, she had not consulted a neurologist. Cranial MRI demonstrated chronic right frontotemporoparietal and left frontal infarcts, some of which were symptomatic and some were silent. After developing new neurological signs, red cell exchange could lead to clinical improvement and no neurological event occurred until six months after apheresis. This observation may support that lowering of hemoglobin S concentration below in 30% of total hemoglobin concentration may suppress recurrence of stroke.

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