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The Therapeutic Effect of Decompression Surgery on Motor and Cognitive Function Losses as a Result of Haemorrhagic Stroke in a Hypertensive Patient: A Case Study

Güven AKÇAY[1]
Dilcan KOTAN[2]

[1] Bolu Abant İzzet Baysal University, Faculty of Medicine, Department of Biophysics, Bolu, Türkiye
[2] Sakarya University, Training and Research Hospital, Department of Neurology, Sakarya, Türkiye

ABSTRACT

Stroke is a serious cerebrovascular disease that can cause disability and death if not diagnosed and treated early. Stroke is the leading cause of death among neurological diseases. In this case study, we describe the therapeutic history of decompression surgery in a 72-year-old patient with motor and cognitive function deficits after acute ischaemic stroke.

Keywords: Haemorrhagic Stroke, Hypertension, Physiotherapy

Introduction

Cerebral blood flow is the most important part of the brain's nutrition and cerebral ischaemia occurs as a result of a decrease in cerebral blood flow in a selected brain region or in the whole brain (Demirdogen, Ozdemir, Akcay, Iyigun, 2023). When the cerebral artery supplying blood to the brain is blocked or ruptured, the blood flow in the central region of the area supplied by the artery falls below the critical level and the blood flow in the areas immediately surrounding the centre is insufficient to maintain the function and vitality of the neurons (Demirdogen et al., 2023). Ischaemic stroke accounts for 87%, intracerebral haemorrhage for 10% and subarachnoid haemorrhage for 3% of all strokes in the World (Benjamin et al., 2018). It has been found that the prevalence of ischaemic stroke is 176/100,000 and haemorrhagic stroke is 90/100,00 in people under 65 years of age worldwide, while the prevalence of ischaemic stroke is 300/100,000 and the prevalence of haemorrhagic stroke is 116/100,000 in people over 65 years of age (Krishnamurthi et al., 2015). Significant impairments in both motor and cognitive functions occur after stroke (Akçay et al., 2024). Although stroke has a high incidence, there is no effective drug treatment yet. Hypertension, diet, alcohol, age, diabetes and gender are factors affecting stroke. In this case report, a 72-year-old woman with hypertension suddenly developed right-sided weakness and loss of consciousness. Computed tomography (CT) revealed haemorrhage in the left middle cerebral artery (MCA). Brain magnetic resonance imaging was performed for differential diagnosis and haemorrhagic infarction was detected. Decompression surgery was carried out.

Case Presentation

72-year-old female patient. The patient with a known diagnosis of hypertension suddenly developed right-sided weakness and loss of consciousness at 07:30. The patient was transferred by ambulance and admitted to the emergency department of the hospital at 08:30. Brain CT and Diffusion MR imaging were performed at 08:45. Brain magnetic resonance imaging was performed for differential diagnosis after a haemorrhage was detected in the area corresponding to the left MCA area on CT. Sinus vein thrombosis was not detected. Diffusion MRI revealed a haemorrhage area with diffusion restrictions in the temporoparietofrontal region. It was evaluated as haemorrhagic infarction. Neurological Examination: consciousness is somnolent. Motor deficit: right hemiplegia. Broka aphasia is present. The patient had high blood pressure and blood pressure was kept around 160/85.

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Corresponding author:
Güven Akçay
E-mail: guvenakcayibu@gmail.com
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Routine haemogram and biochemistry tests were within normal range. The patient developed anisocoria during follow-up and since an increase in shifting was detected in the control CT scan, the patient was consulted to neurosurgery. Decompression surgery was performed.

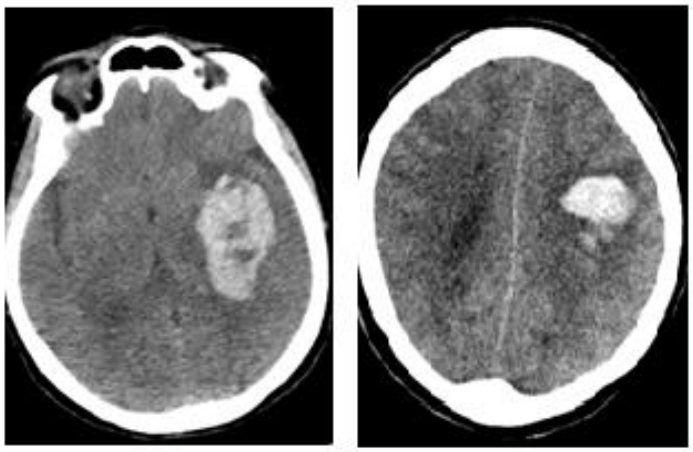

Figure 1. CT imaging on first arrival to the emergency department. Heterogeneous intracerebral haemorrhage area with oedematous hypodensity in the left temporoparietofrontal area and periphery, causing 11 mm right shift

The patient was administered 20% Mannitol 4x125 cc intravenously. It was planned to decrease and stop according to clinical and radiological follow-up. However, because the patient's consciousness continued somnolent and cytotoxic oedema and shifting continued on control CT, dexamethasone 8 mg 4x1/2 was added to the treatment and it was planned to be gradually decreased and stopped. Because the general condition of the patient did not improve despite the treatment, consciousness did not return, respiratory pattern deteriorated and anisocoria developed, control brain tomography was performed and the patient was consulted to the neurosurgery department. Decompression surgery was deemed appropriate because the bleeding area was large, oedema continued to increase despite anti-oedema medical treatments, and shifting increased.

Decompression surgery was performed. During the postoperative follow-up, the patient regained consciousness. Anisocoria improved. Right lower extremity strength was 2/5, while no change was found in right upper extremity strength. Escitalopram was added to the patient whose consciousness and awareness increased, because of crying fits. It was observed that crying spells decreased. Blood and urine cultures were taken because the patient had fever several times during the follow-up period. Escherichia coli (E.coli) was found in urine culture and Pseudomonas aeruginosa was found in blood culture. Vancomycin and meronem were started. According to clinical and laboratory findings, the treatment period was completed to 14 days and ended.

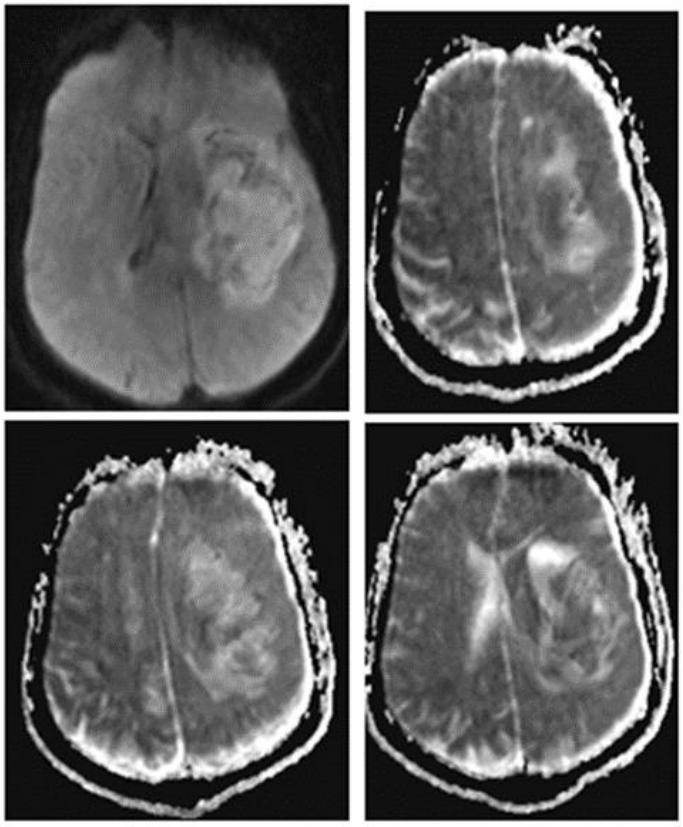

Figure 2. Emergency first arrival diffusion mrg (b1000 and ADC sequence). A haemorrhage area in the temporoparietofrontal region of the left cerebral hemisphere was detected with oedema compressing the left lateral ventricle, including areas of diffusion restriction

Discussion

Stroke is the third leading cause of death and disability in the world after cardiovascular and cancer diseases (Akçay, 2021). Approximately 87% of stroke cases are ischaemic stroke and 13% are haemorrhagic stroke. Ischaemic stroke occurs as a result of rupture or blockage of the vessels feeding the brain (Akçay, 2021). Worldwide, the risk of stroke increases with increasing age and especially after the age of 55 years, the risk of stroke increases 2-fold in each decade (Boehme, Esenwa, Elkind, 2017). Since the elderly population is increasing in developed and developing countries, it is estimated that there will be a rapid increase in stroke cases in the future, which will cause health and economic problems (Akçay, 2021). As a result, prevention of stroke and implementation of effective treatments are also important for our country. Antiaggregant, anticoagulant, thrombolytic, antioedema

Figure 3. Image after anti-edema treatment. Intracerebral haemorrhage area with heterogeneous character, oedematous hypodensity in the left temporoparietofrontal area and periphery, causing 11 mm right shift persists.

and neuroprotective agents are widely used in stroke treatment (Akçay, 2021).

Haemorrhage may occur spontaneously after cerebral infarction or due to antithrombotic or thrombolytic therapy (Sacco et al., 2013). Haemorrhage after infarction may vary from minor petechial haemorrhages to major haemorrhages; these conditions are called haemorrhagic infarction, haemorrhagic transformation and parenchymal haemorrhage. Haemorrhagic transformation type 1 is a condition in which petechiae form at the edges of the infarct; type 2 is a condition in which petechiae are distributed within the infarct area without covering an additional area. In parenchymal haemorrhage, a mass effect occurs with focal blood collection. Parenchymal haemorrhage type 1 refers to haemorrhages that cover up to 30% of the infarcted area and have a mild space-occupying characteristic; type 2 refers to haemorrhages that cover more than 30% of the infarcted area and/or create a significant space-occupying effect. These conditions need to be treated as intracerebral haemorrhage and are considered in the intracerebral haemorrhage group. Our case was in the type 2 group with haemorrhage covering more than 30% of the infarcted area and/or causing a significant space-occupying effect.

Progressive cerebral brain oedema occurs in 10% of ischaemic strokes and clinical deterioration may occur rapidly within 2-5 days. Early decompression surgery (DS) is important in dealing with increased intracranial pressure and cerebral oedema (Ronchetti et al., 2014). Although studies report that DS increases disability in individuals, DS is important in terms of reducing mortality. In this case, DS is one of the treatment options. However, there is no clear consensus on patient selection and timing of DS (Beez et al., 2019). Considering the increasing number of patients diagnosed with stroke at a young age, DS is more important (Zweckberger et al., 2014). Although age is one of the most important areas of interest for the DS decision, it is controversial for which age it will be more beneficial (Powers et al., 2019). Agarwalla et al (2014) reported that DS reduces mortality and disability in younger patients (Agarwalla et al., 2014). Although different studies have reported a poor prognosis in the group over 55 years of age (compared to medical treatment) despite increased survival with DS, similar to the results of this study, there are also studies reporting that age is not a factor affecting mortality (Daou et al., 2016; Jüttler et al., 2014; Zweckberger et al., 2014). Therefore, age may not be an

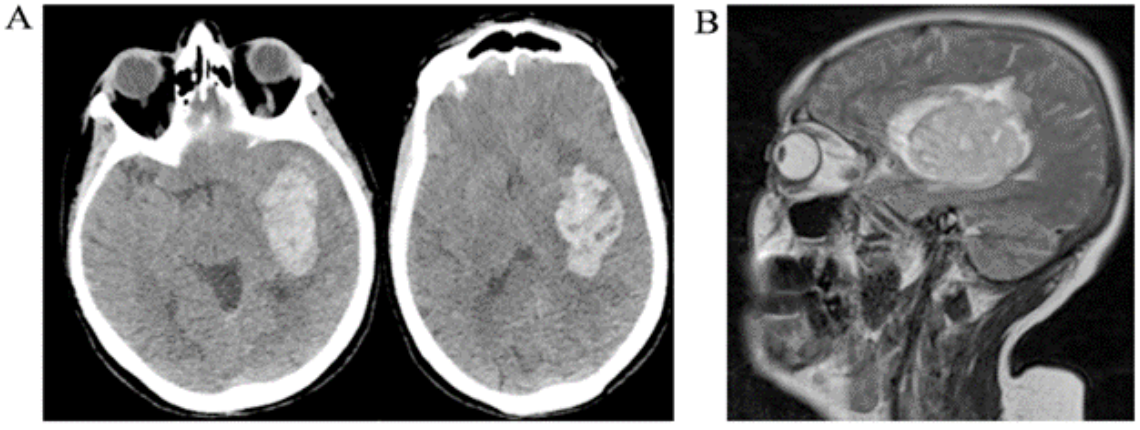

Figure 4. A) Pre-operative CT: left lateral ventricle compression of left hemisphere bleeding area-right lateral ventricle compression with shifting effect, B) Pre-operative Sagittal Section MR: left lateral hemisphere bleeding area with large oedema around it.

indicator for patient selection (Daou et al., 2016). The optimal DS time for MCA infarcts is unknown. In stroke patients, decompression within 24 hours or before clinical signs of herniation may improve mortality and functional outcomes (Shah et al., 2016). Neurological deterioration occurs within 5 days of stroke onset, with the highest mortality rate due to transtentorial herniation and subsequent brain death occurring within 3 days. The mortality rate due to malignant MCA infarction is around 80% without surgical intervention (Agarwalla et al., 2014). Agarwalla et al. reported that oedema-related deterioration in MCA infarcts is most common in the 48-hour time interval. (Agarwalla et al., 2014). In this study, 9 patients (52.9%) were processed in the first 24 hours, 5 patients (29.4%) in the first 48 hours, and 3 patients (17.6%) in 72 hours or later. Although there are studies reporting that stroke patients should be admitted to DS within the first 24 hours from the onset of symptoms, the widely accepted view is that the critical period for DS is the first 48 hours (Shah et al., 2016; Wijdicks et al., 2014).

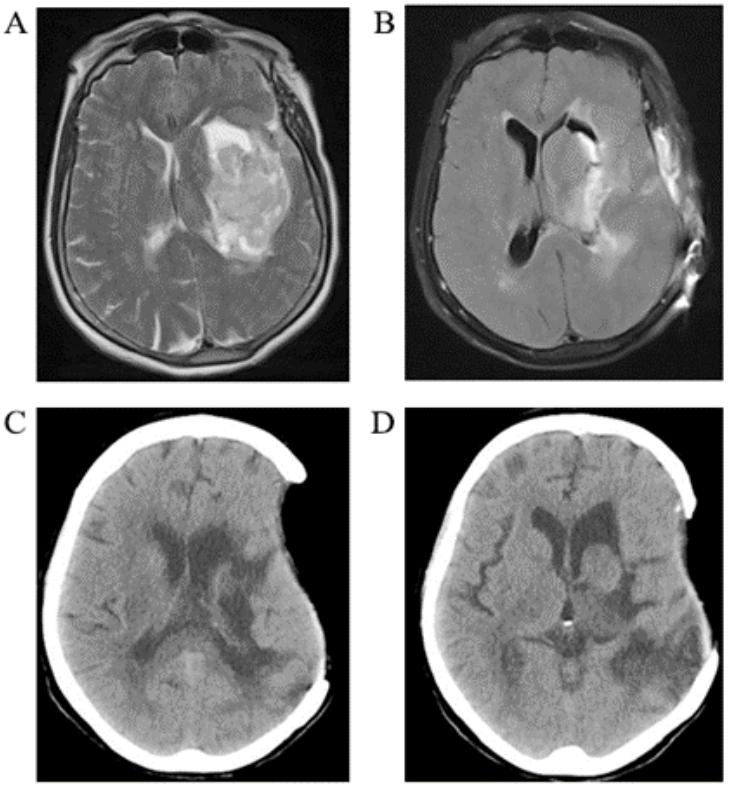

Figure 5. A) Pre-decompression operative MR (T2 Sequence): left lateral ventricular compression due to haemorrhage in the left cerebral hemisphere and right lateral ventricular compression due to shunting; B) Post-decompression operative 24th hour MR (T2 Fair): decrease in shunting and decrease in right lateral ventricular compression 24 hours after the operation C) Post-decompression operative 6th month CT, D) Post-decompression operative 6th month CT: 6 months after the operation, marked improvement of shifting and removal of compression on both ventricles

In this case report, a 72-year-old hypertensive female patient suddenly developed right-sided weakness and loss of consciousness and underwent decompression surgery for haemorrhagic infarction in the left MCA. After decompression surgery, the patient's shifting decreased. The patient has been treated in the palliative service for more than 1 year, and as a result of drug therapy and physiotherapy, the patient's last condition has improved motor function in the left arm and leg, but loss of function continues on the right side. Although cognitive function is partially restored, the patient is aphasic.

Conclusion

In conclusion, the ischaemic stroke caused by haemorrhagic infarction in a hypertensive patient resulted in permanent damage to motor and cognitive functions. After decompression surgery, the patient was intubated for a long period of time and then extubated and continued with medication and partially recovered motor and cognitive functions. Motor function continues to be reinforced with physiotherapy.

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