

Decompressive hemicraniectomy for treatment of space occupying ischemic stroke after repair of type-A aortic dissection



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Postoperative stroke after cardiac surgery is often a lethal complication. Herein, we report on a patient who suffered space-occupying ischemic stroke after surgical treatment of type A aortic dissection. He underwent decompressive hemicraniectomy and, despite residual hemianopsia and left side flaccid hemiplegia, survived surgery and was discharged for rehabilitation. This observation suggests that early consultation with a neurosurgeon, intracranial pressure monitoring and, when indicated, decompressive hemicraniectomy should be considered in order to reduce the high mortality rate associated with ischemic stroke after cardiac surgery

KEY WORDS: Aortic dissection, Cardiac surgery, Craniectomy, Hemicraniectomy, Stroke allekirjoitus

Introduction

Stroke is a major and frequent adverse event occurring after complex cardiac surgery. A significant number of patients present with acute brain ischemic injury before surgery, which carries a significantly increased risk of

mortality¹ as surgery may further aggravate the ischemic brain injury. Herein we report on a patient with pre-operative signs of cerebral malperfusion who developed space-occupying ischemic stroke after repair of acute type A aortic dissection and was successfully treated by decompressive hemicraniectomy.

Case Report

A 46-year-old man was admitted at our Institution because of sudden excruciating chest pain which started about one hour before admittance. He has been previously scheduled for elective repair of aortic valve insufficiency associated with an aneurysm of the ascending aorta of 49 mm in diameter. He underwent elective coronary angiography 5 days before, which did not reveal any sign of coronary artery disease. At admission, he was conscious, without signs of hemiplegia, but was somewhat restless, drowsy and his head and eyes deviated to the right side. The right upper arm arteries were pulse-

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less and a marked difference in brachial artery systolic pressures was detected (60 vs. 130 mmHg). Also the right carotid artery pulse was weak. At echocardiography, a diagnosis of type-A aortic dissection with severe aortic valve regurgitation was made. Because of suspicion of impending cerebral ischemia, computed tomography (CT) was not performed preoperatively and the patient was transferred immediately to the operating room. Baseline regional cerebral oxygen saturation was markedly lower on the right side (30% vs. 55%). Because of the critical conditions, sternotomy was performed and cardiopulmonary perfusion was promptly established. This has led to improvement in the regional cerebral oxygen saturation as soon as cardiopulmonary perfusion was started on (50% vs. 70%). Dissection involved the ascending aorta and aortic arch. Ascending aorta was cannulated and a Bentall-DeBono reconstruction was performed. A distal open aortic anastomosis was performed at the level of the brachiocephalic artery during hypothermic circulatory arrest of 19.5 min with a systemic temperature of 18°C. Selective cerebral perfusion was not performed in order to avoid any possible injury to the epiaortic vessels. Aortic dissection involved also the aortic arch, but because of patient's poor preoperative neurological status, this was left untreated. At the end of the operation, the right side regional cerebral oxygen saturation improved, but it was still lower than the left side (46% vs. 64%). Doppler ultrasound showed normal blood flow in the right common and internal carotid arteries, which were fully open. Postoperatively, the patient had anisocoria and was unconscious. CT showed a space-occupying brain infarction of the right middle cerebral artery territory and a smaller infarction of the anterior cerebral artery territory (Fig. 1A). Intracranial pressure monitoring was started. Initially intracranial pressure was below 20 mmHg, but slowly increased over 30 mmHg despite best medical treatment, including sedation, controlled ventilation and body temperature control. Because of this, a decompressive right side hemicraniectomy was done on the fifth postopera-

tive day, which allowed a significant decreased of intracranial pressure (≤ 20 mmHg). Sedation was discontinued on the 13th postoperative day and the patient slowly regained consciousness. On the 15th postoperative day, CT scan showed a reduction of edema in the infarcted area (Fig. 1B). The frontal hemorrhagic area was reduced in volume as well. He developed hemianopsia and left side flaccid hemiplegia. Patient's general conditions significantly improved and he was discharged on the 20th postoperative day to the neurology department for rehabilitation. Fifty days after surgery he was in good condition and underwent CT scan which revealed a residual dissection limited to the aortic arch whose maximal diameter was 33 mm. Cranioplasty was planned three months after hemicraniectomy.

Discussion

Patients with space-occupying hemispheric brain infarction have a very poor prognosis as up to 80% of patients die, while survivors are left severely disabled². Decompressive surgery, i.e. removal of part of the skull and duraplasty, has been proposed to accommodate shifts of brain tissue and normalize intracranial pressure. These measures may prevent transtentorial herniation and preserve cerebral blood flow. The results of recent studies^{3,4} indicate that hemicraniectomy may significantly reduce mortality and poor outcome of these patients when treated within 48 hours from the ischemic event.

Stroke after cardiac surgery is a frequent adverse event⁵ and is associated with a mortality rate of about 20%⁵. Among cardiac procedures, surgical treatment for type A acute aortic dissection is associated with the highest risk of hospital mortality and stroke¹. Such a risk is particularly high in patients with preoperative acute ischemic brain injury¹, because use of cardiopulmonary bypass, thromboembolism secondary manipulation of the ascending aorta, aortic arch and its branches as well as a brief period of intraoperative hypothermic circulatory arrest may



Fig. 1: A: computed tomography scan showing a large brain infarction in the right middle cerebral artery territory and a smaller one in the anterior cerebral artery territory. B: computed tomography scan 20 days after hemicraniectomy showing a reduction of edema in the infarcted area. The frontal hemorrhagic area was reduced in volume.

further aggravate brain ischemia. Indeed, both selective cerebral perfusion and hypothermic circulatory arrest are associated with some increase in intracranial pressure^{6,7}. To the best of our knowledge, this is the first reported case of hemicraniectomy for space-occupying brain infarction after cardiac surgery. Herein postoperative intracranial pressure monitoring was shown to effectively guide the treatment of this severe condition and indicated decompressive surgery as the only feasible procedure to release compression of healthy brain structures and normalize intracranial pressure. Despite residual hemianopsia and hemiplegia, the patient slowly recovered from the event and this aggressive approach revealed itself being life-saving. Therefore, we believe that early consultation with a neurosurgeon should be considered in the management of space-occupying cerebral infarction also after cardiac surgery. Indeed, we may assume that decompressive hemicraniectomy may be effective particularly in these patients as the use of cardiopulmonary bypass during major complex cardiac surgery is *per se* associated with development of diffuse brain edema.

In conclusion, this observation suggests that hemicraniectomy for treatment of space-occupying ischemic stroke occurring after cardiac surgery may be life saving. Early consultation with a neurosurgeon should be considered in order to reduce the high mortality rate associated with postoperative ischemic stroke.

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