



Full Length Research Paper

Postoperative bilateral thalamic infarct: Rare but mortal neurologic complications of the coronary artery bypass graft surgery

Sureyya Talay, Derih Ay, Ozgur Dag, Mehmet Ali Kaygin and Bilgehan Erkut*

Department of Cardiovascular Surgery, Erzurum Regional Training and Research Hospital Erzurum, Turkey.

Abstract

We report a case of an early postoperative major neurologic complication following coronary artery bypass graft operation with cardiopulmonary bypass. Computed tomography scanning at the first postoperative day of the head revealed a cerebral infarction in bilaterally thalamic location and mesecephalon with a surrounding edema of the tissue. Following the antiedematous therapy, computed tomography scanning was repeated at the fifth day of postoperation, while cerebral pathology was proved to persist at the twelfth day of postoperation. Patients' neurological status did not improve with medication and as such, worsened gradually. However, extubation was not possible during the intensive care unit follow-up period. Consequently, the patient died at the fifteenth day of post operation.

Keywords: Bilateral thalamic infarct, myocardial revascularization/adverse effects, cerebrovascular accident, postoperative stroke, risk factors.

INTRODUCTION

Early postoperative complications of surgical revascularization of the heart may involve all organ systems including the heart, lungs, gastrointestinal tracts and nervous system by different degrees. Specific complications are generally rare, but can occur as a heart attack, death or stroke (Arthur et al., 1996). Neurological injury presents a wide perspective of the mental status which differs from minor neurocognitive disabilities to coma. Coronary artery bypass grafting (CABG) with cardiopulmonary bypass (CPB) technique is reported to be with a percentage of 3 to 5% for postoperative stroke in various publications. Postoperative stroke may result to a variety of operative sources (Anyanwu et al., 2007; Oliveira et al., 2008) and the ascending aorta is considered to be the main reason for mobile plaques and/or calcifications which can be affected by side clamps during proximal anastomosis and aortic cannulation. As such, emboli from this structure may lead

to stroke postoperatively. This major and mortal neurologic complication produced a catastrophic clinical situation. In this case, the origin of emboli was unclear and we were unable to verify or exclude a certain determination. Nonetheless, this major neurologic complication is considered to be lethal by our experience.

Case report

We report a case of an early postoperative major neurologic complication following coronary artery bypass graft operation with CPB. In January 2010, a 47 year old male patient with a history of unstable angina pectoris was presented to the emergency department following hypertension episodes and nausea. He has a past medical history of hypertension, hyperlipidemia and tobacco smoking for 22 years. On physical examination, he was alert with a normal mental status. His arterial blood pressure was 170/90 mmHg with a sinus and his regular heart rate was between 100 and 110. His oral temperature was 38°C with oxygen saturation of 95% and his lungs and heart were clear to auscultation without

*Corresponding author. E-mail: bilgehanerkut@yahoo.com. Tel: 0090 442 232 5755.

murmurs. Neurological examination was also noted to be normal, whereas peripheral arterial pulses were palpable in all extremity areas. However, cervical murmur was not noted with carotid auscultation, in that the remainder of the physical examination was normal.

Laboratory examination was normal and the chest radiograph showed no abnormalities including aortic calcification. By the transthoracic echocardiogram, no aortic insufficiency and/or stenosis were observed and the left ventricular ejection fraction was 60% without any wall motion abnormality. As such, the coronary angiography demonstrated a critical stenosis for the left anterior descending artery, the high lateral branch of the circumflex coronary artery and the right coronary artery (Figure 1). However, there was no evidence suggestive of thrombus in the left ventricle, but a coronary arterial bypass grafting (CABG) was indicated after the presentation of the coronary lesions. Preoperatively, the patient was re-evaluated by the laboratory findings clinically, and it showed that there was no neurological pathology and laboratory examination.

After routine preoperative preparation, the patient was undertaken in a general anesthesia with central venous catheterization and arterial monitorization. Then, the left internal thoracic artery and right lower extremity great saphenous vein were harvested for grafts after sternotomy. Three reversed autogenous saphenous vein grafts were anastomosed to the right coronary artery distally, the second obtuse branches of the circumflex artery and to the diagonal artery distally which were followed by a left internal thoracic artery to the left anterior descending coronary anastomosis. The aortic x-clamp time was 62 min and the proximal anastomosis was performed with a single application of a side-biting aortic clamp. As such, the operation was closed with an uneventful routine. Upon returning from the operation room, the patient was noted to be hemodynamically stable for the early postoperative period without any hypotensive or tachycardia episodes and the evaluation of his postoperative vital signs was normal in the intubation period. The patient's pupil examination revealed a normal shape and size. Bilaterally, the pupils were constrictive to light on both direct and consensual response. Although a normal pupil examination was done, he did not have the normal extremity movement and the related awakening of the cerebral functions. Besides, there was no spontaneous eye opening. As a result of this pathological undesirable situation, the computed tomography (CT) was made. CT scanning revealed a cerebral infarction in bilaterally thalamic location and mesecephalon with surrounding edema of the tissue at the second postoperative day (Figure 2). The antiedematous therapy (deksametazon sodium 4 mg, as 3x1 P.E) was started on the patient and the cerebral pathology was proved to persist at the twelfth day of postoperation. The patient's neurological status did not improve with medication and as such, worsened

gradually. However, extubation was not possible during the intensive care unit follow-up period. As a result, the patient died at the fifteenth day of post operation.

Comment

CABG is one of the most frequently performed surgical procedures. The annual number of operations is approximately 800,000 worldwide. Parallel to the increased quantity of this operation, co-morbidities, mortalities and complications also enhance the number steadily. Early deaths after CABG operation were reported to be around 4 to 25% in heterogeneous groups. These premature deaths occur because of patient ages, severity and location of atherosclerosis in coronary system, chronic lung diseases, lower left ventricle function, ischemic mitral insufficiency, unstable angina pectoris, emergency cases and co-morbidities such as hypertension and diabetes (Arthur et al., 1996). Early postoperative complications of surgical revascularization of the heart may involve all the systems of the organ including the heart, lungs, gastrointestinal tracts and the nervous system by different degrees. Specific complications are generally rare, but can occur as an heart attack, death or stroke (Arthur et al., 1996; Anyanwu et al., 2007).

Stroke is defined as a focal or generalized cerebral dysfunction by vascular pathologies lasting more than 24 h. As clearly stated by the previous medical reports, one of the most devastating and catastrophic postoperative situation after CABG operation is neurologic injury (Anyanwu et al., 2007; Oliveira et al., 2008; Glance et al., 2007). The neurological injury presents a wide perspective of the mental status which differs from the minor neurocognitive disabilities to coma. CABG with cardiopulmonary bypass technique is reported to be with a percentage of 3 to 5% for postoperative stroke in various publications (Arthur et al., 1996; Anyanwu et al., 2007; Oliveira et al., 2008; Glance et al., 2007). Postoperative stroke may result to a variety of operative sources. Ascending aorta is considered to be the main reason for mobile plaques and/or calcifications which can be affected by side clamps during proximal anastomosis and aortic cannulation. Emboli from these structures may lead to stroke postoperatively (Ngaage et al., 2008). The neurological defects are also reported to be associated with the cardiopulmonary bypass circuit by lower intra-operative circulation pressures and micro and macro emboli which can be caused by gasses, foreign surface reactions and a wide variety of hematological factors such as platelet clots (Lev-Ran et al., 2005). Early postoperative arrhythmia and atrial fibrillation may be another reason for cardiac emboli in the central nervous system. On the other hand, concomitant cerebral and carotid system atherosclerosis enhances the postoperative rates of stroke (Manabe et al., 2002).



Figure 1. Preoperative coronary angiography with severe coronary stenosis.

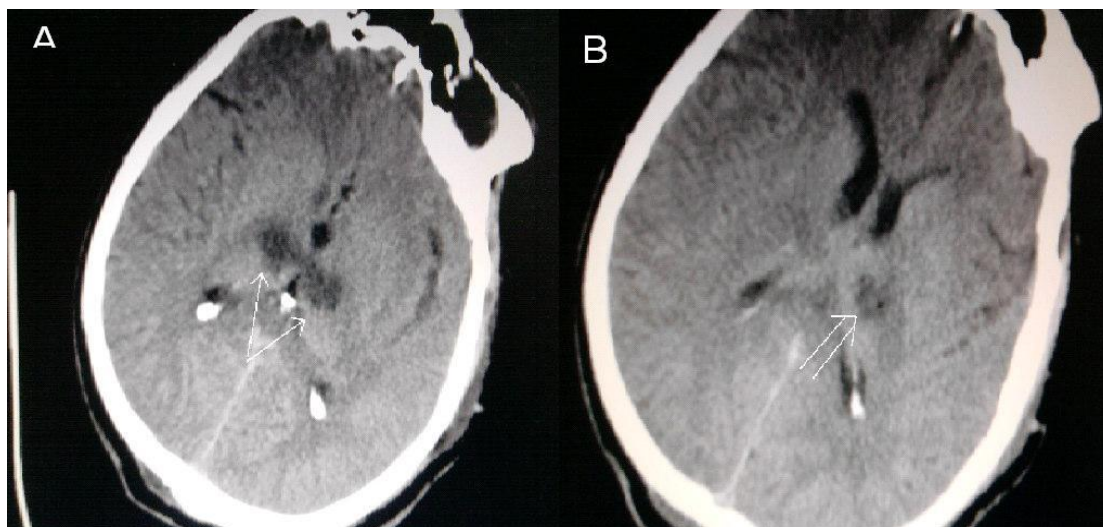


Figure 2. Postoperative CT demonstrating mesencephalic and bilateral thalamic infarction early at the fifth day.

Evaluations of the surgical technique of practice have been focused on the elimination of this neurological complication. Despite these efforts, elderly patients undergoing CABG operations are at higher risk of stroke depending on the facts of aorta calcifications and cerebral conditions. Almost every patient, over 75,

presents a severe aortic atheroma by postmortem evaluations. In this case, it is the most frequent reason why emboli leads to cerebral infarctions (Patel et al., 2002). With regards to this view, the incidence of cerebral emboli may be reduced by avoiding any manipulations of the aorta as in no-touch aorta off-pump coronary surgery

and MIDCAB operations. Definition of the aortic atherosclerosis and the existing calcifications are advocated to be executed by preoperative transeosophageal echocardiography in the medical literature. In our opinion, this non-invasive imaging technique is definitively profitable, but administration difficulties may limit its practice especially for severe coronary atherosclerosis patients with unstable angina pectoris. Naresh et al. (2000) reported a significant reduction on postoperative stroke among cardiac surgery patients with preoperative transeosophageal echocardiographic evaluations and offpump techniques. They underlined the rate of mobile atherosclerosis at the aorta in a rate of 2.84% for 3,660 patients and reported a stroke rate of 0.96%, which is considerably lower than other publications which indicate the beneficial sides of preoperative echocardiography. Additionally, among off-pump CABG patients, he reported a peri-operative stroke rate for 0%.

Conventional chest roentgenograms are another valuable preoperative evaluation technique for aortic calcifications. Findings on x-ray and intra-operative palpations may play a life-saving role on cannulation and anastomosis decisions. On the other hand, the carotid system Doppler ultrasonography may alert the surgeon against possible extra cerebral and extra cardiac sources of postoperative stroke. Postoperative stroke may occur because of focal or multi-focal and/or generalized cerebral infarctions. Several studies and medical reports (Stroobant et al., 2002) underline the possible reasons for peri-operative neurological deterioration; although postoperative cerebral lesion localizations still remain unclear. Directly, the localization of infarction is clearly the most significant factor of the patients' clinical outcome. Weinstein et al. (2001) reported their experience of perioperative stroke among CABG operations. He published the data of cerebral infarction localizations and its determinatives in a group of patients that consisted of 2,217 consecutive cases, while the stroke rate was reported in 51 cases (2.3%). Cerebral localizations were also classified as 21 left hemisphere, 10 right hemisphere, 7 bilateral, 1 brainstem, 7 lacunar and 5 indeterminate. Conclusively, he reported 75% (18 out of 24 patients) of the cases as left-sided. Contrary to common belief, stroke patients were observed to be younger than the non-stroke group (66.3 ± 10.52 versus 71.4 ± 8.47 years). Weinstein advocated a side-hole aortic cannula to reduce stroke rates eventually. In this present case report, an end-hole aortic cannulation was preferred, while in our case report, we specifically present a cerebral postoperative infarction which took place in the mesencephalon and bilateral thalamic region. This major and mortal neurologic complication produced a catastrophic clinical situation. In this case, the origin of emboli was unclear and we were not able to verify or exclude a certain determination. Nonetheless, this major neurologic complication is considered to be lethal by our experience.

REFERENCES

- Anyanwu AC, Filsoofi F, Salzberg SP, Bronster DJ, Adams DH (2007). Epidemiology of stroke after cardiac surgery in current era. *J. Thorac. Cardiovasc. Surg.*, 134: 1121-1127.
- Arthur E, Baue MD (1996). *Glenn's Thoracic and Cardiovascular Surgery*, Sixth Edition. Appleton. And. Lange, pp. 2095-2099.
- Glance LG, Osler TM, Mukamel DB, Dick AW (2007). Effect of complications on mortality after coronary artery bypass grafting surgery: Evidence from New York State. *J. Thorac. Cardiovasc. Surg.*, 134: 53-58.
- Lev-Ran O, Braunstein R, Sharony R, Kramer A, Paz Y, Mohr R, Uretzky G (2005). No-touch aorta off-pump coronary surgery: The effect on stroke. *J. Thorac. Cardiovasc. Surg.*, 129: 307-313.
- Manabe S, Shimokawa T, Fukui T, Fumimoto K, Ozawa N, Seki H, Ikenaga S, Takannashi S (2002). Influence of carotid artery stenosis on stroke in patients undergoing off-pump coronary artery bypass grafting. *Eur. J. Thorac. Surg.*, 21: 434-439.
- Naresh T, Manisha M, Ravi RK, Anil M (2000). Reduced neurological injury during CABG in patients with mobile aortic atheromas: a five year follow-up study. *Ann. Thorac. Surg.*, 70: 1558-1564.
- Ngaage DL, Cowen ME, Griffin S, Guvendik L, Cale AR (2008). Early neurological complication after coronary artery bypasses grafting and valve surgery in octogenarians. *Eur. J. Cardiothorac. Surg.*, 33: 653- 659.
- Oliveira DC, Ferro CR, Oliveira JB, Malta MM, Barros NP, Cano SJ, Martins SK, Souza LC, Jatene AD, Piegas LS (2008). Risk factors for stroke after coronary artery bypass grafting. *Arq. Bras. Cardiol.*, 91: 213-216.
- Patel NC, Deodhar AP, Grayson, Pullan M, Keenan DJM, Hasan R, Fabry BM (2002). Neurological outcomes in coronary surgery: independent effect of avoiding cardiopulmonary bypass. *Ann. Thorac. Surg.*, 74: 400-406.
- Stroobant N, Nooten GV, Belleghem YV, Vingerhoets G (2002). Shortterm and long-term neurocognitive outcome in on-pump versus offpump CABG. *Eur. J. Thorac. Surg.*, 22: 559-564.
- Weinstein G (2001). Left hemispheric strokes in coronary surgery: implications for end -hole aortic cannulas. *Ann. Thorac. Surg.*, 71: 128-132.