

Autologous Heparinized Oxygenated Blood Reperfusion in Acute Ischemic Stroke Caused by Infective Endocarditis: A Case Report

Lung Chan¹, Yen-Jun Lai², Hon-Man Liu³, Ai-Hsien Li⁴

Abstract-

Purpose: Cerebral infarction secondary to septic embolism is a lethal complication of infective endocarditis. However, its effective treatment has not been well defined in the previous literature.

Case Report: We presented a patient suffering from right middle cerebral artery (MCA) embolism with left hemiplegia and infective endocarditis, who was once treated with intra-arterial thrombolysis with autologous heparinized arterial blood successfully. The patient recovered well with muscle power improvement significantly, but was attacked by another septic embolization with mycotic aneurysm rupture of left side MCA and intracranial hemorrhage. Despite of emergent decompressive craniectomy the patient died of this complication on the 25th day of his hospitalization.

Conclusion: In this case, we demonstrated the safety and effectiveness of the autologous heparinized arterial blood in recanalization of the occluded vessel.

Key Words: infective endocarditis, acute ischemic stroke, autologous heparinized oxygenated blood

Acta Neurol Taiwan 2011;20:267-271

INTRODUCTION

Stroke is one of the most common complications of infective endocarditis (IE), of which the incidence varies in different reports⁽¹⁾. It mostly attack male^(2,3,4), especially more than 60 years old⁽²⁾, and Staphylococci and streptococci are the two most common pathogens reported^(5,6). Sophisticated history taking and appreciation of new audible murmur could alert us the existence of IE, and transesophageal echocardiography (TEE) and transthoracic echocardiography (TTE), are two non-

invasive diagnostic tools for its definite diagnosis⁽⁷⁾. About one-third to one-half of IE patient will have cardiac complications⁽⁸⁾. However, embolization of the vegetation fragments is another distressingly common complication of IE. Among them, symptomatic cerebrovascular accident from distal embolization occur in about 35 percent of patients^(9,10-14). Silent cerebrovascular complications (including ischemia and microhemorrhage) may occur in up to 80 percent of patients⁽¹⁴⁻¹⁷⁾. Furthermore, the role of recombinant tissue plasminogen activator (r-TPA) in treating patient with IE present-

From the ¹Division of Neurology, Department of Internal Medicine, ²Medical Image, ³Department of Medical Image, National Taiwan University Hospital, ⁴Cardiovascular Center, Far-Eastern Memorial Hospital, New Taipei City, Taiwan.

Correspondence to: Ai-Hsien Li, MD. PhD. No. 21, Sec. 2, Nan-Ya South Road, Ban-Ciao, New Taipei City, Taiwan.
E-mail: las1012.tw@yahoo.com.tw

ed as acute ischemic stroke is still under debating and there is no consensus of guidelines in different countries in regard to r-TPA usage for IE-related stroke. Hereby, we report such a patient suffering from IE with ischemic stroke, and we treated him with endovascular method.

CASE REPORT

A 53-year-old man suffered from sudden onset of general weakness and loss of speech at 16:00 during work. He was brought to emergency department at 17:18 and emergent brain computer tomography (CT) at 17:35 revealed no intracranial hemorrhage (Figure 1A). His blood pressure was stable but fever up to 39.1°C. His conscious was clear and left limb paralysis with eye ball deviated to right (NIHSS 12/42). Hemoglobin was only 10 gm/dl (12 gm/dl one month ago in health examination) at emergency department, and had a 5 kg body

weight lost in last one month associated with intermittent fever, cough and general weakness. Under the impressions of right middle cerebral artery (MCA) infarction, fever with unknown origin and anemia suspected due to other undetermined bleeding tendency, patient was excluded from intravenous r-TPA therapy. After discussion with family, emergency cerebral angiogram was performed and right middle cerebral artery total occlusion was noted (Figure 2A). Intra-arterial (IA) autologous heparinized oxygenated blood irrigation was performed, and restored blood flow to TICI (Thrombolysis In Cerebral Infarction) 3 (Figure 2B). After admission, an audible murmur was noted over left sternal border, transthoracic cardiac echo showed vegetation over aortic valve and infective endocarditis (IE) was impressed. Since the blood culture yielded Staphylococcal species, adequate antibiotic treatment started and fever subsided on day 4. During this period, his neurological status kept

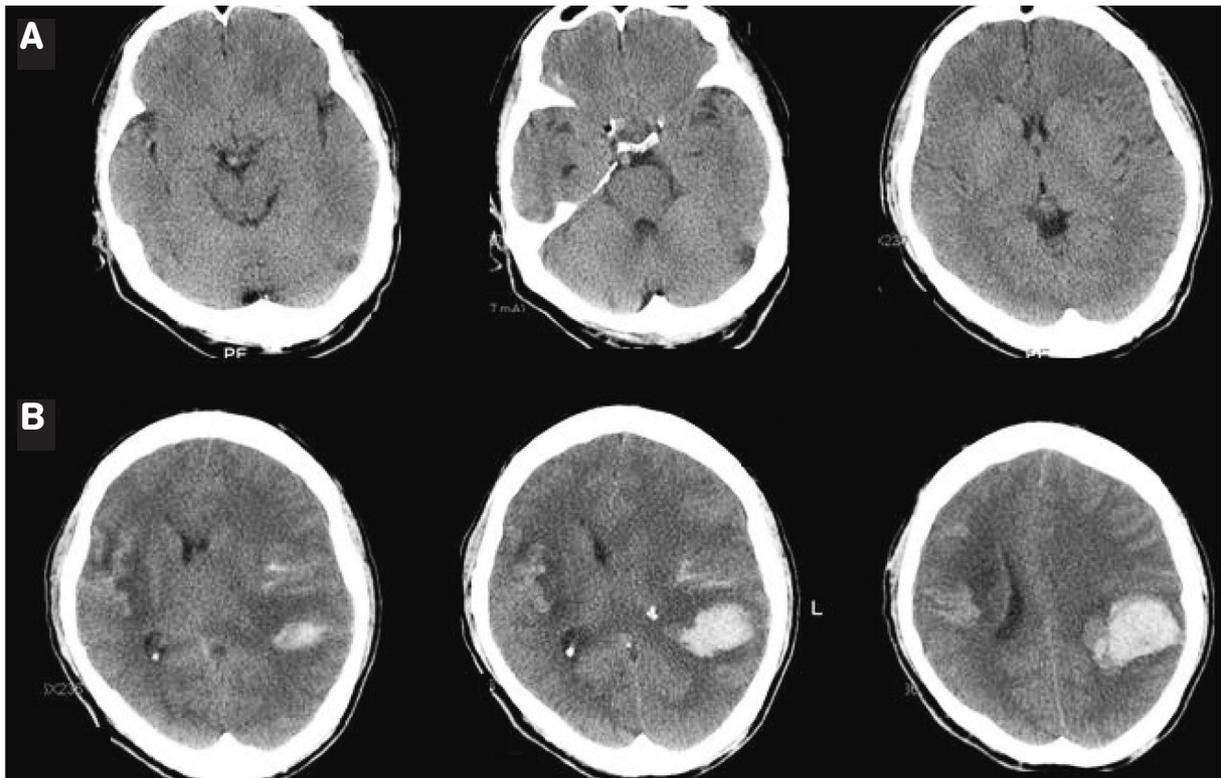


Figure 1. (A) Showed a normal brain computer tomography without contrast in emergency room, 95 minutes after event happened. (B) Brain computer tomography without contrast on Day 12, which showed a hematoma in left parietal region, subarachnoid hemorrhage along superior sulci, and sylvian fissures were noted. Compression of lateral ventricles, more in left side and uncal herniation were also noted.

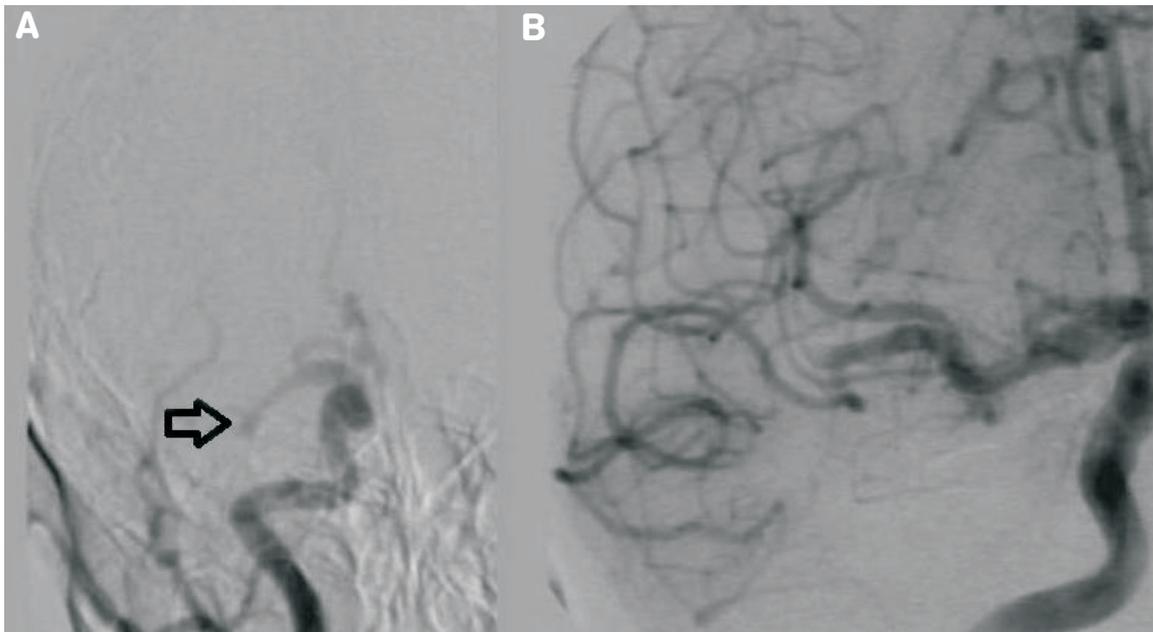


Figure 2. Cerebral angiography before and after treatment. (A) Showed right middle cerebral artery occlusion in M2 (Arrow). (B) After autologous heparinized oxygenated blood irrigation, right middle cerebral artery regained its flow to TICI 3.

improving to NIHSS 7, with clear and alert consciousness, and his rehabilitation program was undertaken very well. However, another episode of sudden conscious change happened to him on the 12th day after his admission, emergent brain CT revealed left parietal lobe hemorrhage, which is remote from first lesion and subarachnoid hemorrhage with severe brain swelling and uncal herniation (Figure 1B). Under the impression of another septic embolism with hemorrhagic infarction as well as mycotic aneurysm rupture, emergency decompressive craniectomy was performed and intensive supportive treatment was given. Unfortunately, the patient passed away on day 25.

DISCUSSION

Symptomatic cerebrovascular complications occurred in 35% of patients with IE⁽¹⁴⁾. The most common neurologic complication is embolic stroke and intracranial hemorrhage. Septic emboli can occlude and/or damage the blood vessels, causing cerebral infarction. In addition to cerebral infarction, infected emboli could cause cranial arteritis, mycotic aneurysm

and brain abscess. Besides, hemorrhagic transformation and septic arteritis are the most common causes of the intracranial hemorrhage in IE⁽¹⁸⁾. In this case, patient was treated with intra-arterial thrombolysis successfully for his right MCA septic embolism, but was suspected to have another mycotic aneurysm rupture, which is remote from the lesion we treated, on the 12th day after admission and leading to the death of the patient.

If a patient presented with stroke and unexplained fever, the diagnosis of infective endocarditis should always be kept in mind. Careful history taking should be highlighted in specific groups including intravenous drug user, patients having prosthetic heart valves, structural heart disease, previous history of IE, and poor oral hygiene; those who are recently hospitalized with nosocomial endocarditis, under hemodialysis, infected with HIV carriers or previously having dental surgery⁽¹⁹⁾ are also among the high risk groups. The physical examination should include careful cardiac examination for new regurgitate murmur and heart failure. Besides, associated peripheral cutaneous or mucocutaneous lesions of IE include petechiae, splinter hemorrhages, Janeway lesions, Osler's nodes and Roth spots⁽¹⁹⁾. Blood culture

reports and echocardiographic findings were also one of the major criteria of Duke Criteria for diagnosis of infective endocarditis.

Infective endocarditis related acute ischemic stroke is excluded from the use of intravenous r-tPA in Taiwan⁽²⁰⁾ and Europe, but not in the United State of America, Canada, and Malaysia⁽²¹⁾. However, there is very few reports in the literature that described the successful experiences of intra-arterial thrombolysis in the treatment of IE-related stroke⁽²²⁾. Furthermore, autologous oxygenated blood injection via micro-catheter was first suggested in 2009⁽²³⁾, as an adjunct to intra-arterial recanalization. The recanalization rate may up to 73.2% in a small series⁽²⁴⁾, the technique in deliver oxygenated blood through a microcatheter positioned distal to the site of occlusion was feasible and safe. Different from before, in our case we delivered autologous heparinized oxygenated blood via a microcatheter positioned proximal to the occlusion site and successfully reopened the occlusion vessels. To the best of our knowledge, this may be the first report in using oxygenated blood in recanalization of acute ischemic stroke due to IE. Despite the patient died of another septic embolism and its sequel, our initial success using autologous blood to open the occluded cerebral could still a treatment of choice while encountering such patients in the future.

REFERENCES

1. Tleyjeh IM, Abdel-Latif A, Rahbi H, Scott CG, Bailey KR, Steckelberg JM, Wilson WR, Baddour LM. A systematic review of population-based studies of infective endocarditis. *Chest* 2007;132:1025-1035.
2. Hill EE, Herijgers P, Claus P, Vanderschueren S, Herregods MC, Peetermans WE. Infective endocarditis: changing epidemiology and predictors of 6-month mortality: a prospective cohort study. *Eur Heart J* 2007;28:196-203.
3. Lerner PI, Weinstein, L. Infective endocarditis in the antibiotic era. *N Engl J Med* 1966;274:199-206.
4. Watanakunakorn C. Changing epidemiology and newer aspects of infective endocarditis. *Adv Intern Med* 1977; 22:21-47.
5. Fowler VG Jr, Miro JM, Hoen B, Cabell CH, Abrutyn E, Rubinstein E, Corey GR, Spelman D, Bradley SF, Barsic B, Pappas PA, Anstrom KJ, Wray D, Fortes CQ, Anguera I, Athan E, Jones P, van der Meer JT, Elliott TS, Levine DP, Bayer AS; ICE Investigators. Staphylococcus aureus endocarditis: a consequence of medical progress. *JAMA* 2005; 293:3012-3021.
6. Murdoch DR, Corey GR, Hoen B, Miró JM, Fowler VG Jr, Bayer AS, Karchmer AW, Olaison L, Pappas PA, Moreillon P, Chambers ST, Chu VH, Falcó V, Holland DJ, Jones P, Klein JL, Raymond NJ, Read KM, Tripodi MF, Utili R, Wang A, Woods CW, Cabell CH; International Collaboration on Endocarditis-Pro prospective Cohort Study (ICE-PCS) Investigators. Clinical presentation, etiology, and outcome of infective endocarditis in the 21st century: the International Collaboration on Endocarditis-Pro prospective Cohort Study. *Arch Intern Med* 2009;169:463-473.
7. Mylonakis E, Calderwood SB. Infective endocarditis in adults. *N Engl J Med* 2001;345:1318-1330.
8. Durack DT, Lukes AS, Bright DK. New criteria for diagnosis of infective endocarditis: Utilization of specific echocardiographic findings. *Am J Med* 1994;96:200-202.
9. Jones HR Jr, Siekert RG. Neurological manifestations of infective endocarditis. Review of clinical and therapeutic challenges. *Brain* 1989;112 (Pt 5):1295-1315.
10. Harrison MJ, Hampton JR. Neurological presentation of bacterial endocarditis. *Br Med J* 1967;2:148-151.
11. Røder BL, Wandall DA, Espersen F, Frimodt-Møller N, Skinhøj P, Rosdahl VT. Neurologic manifestations in Staphylococcus aureus endocarditis: A review of 260 bacteremic cases in nondrug addicts. *Am J Med* 1997;102: 379-386.
12. Parrino PE, Kron IL, Ross SD, Shockey KS, Kron AM, Towler MA, Tribble CG. Does a focal neurologic deficit contraindicate operation in a patient with endocarditis? *Ann Thorac Surg* 1999;67:59-64.
13. Ruttman E, Willeit J, Ulmer H, Chevtchik O, Höfer D, Poewe W, Laufer G, Müller LC. Neurological outcome of septic cardioembolic stroke after infective endocarditis. *Stroke* 2006;37:2094-2099.
14. Snygg-Martin U, Gustafsson L, Rosengren L, Alsiö A, Ackerholm P, Andersson R, Olaison L. Cerebrovascular complications in patients with left-sided infective endocarditis are common: a prospective study using magnetic

- resonance imaging and neurochemical brain damage markers. *Clin Infect Dis* 2008;47:23-30.
15. Cooper HA, Thompson EC, Laureno R, Fuisz A, Mark AS, Lin M, Goldstein SA. Subclinical brain embolization in leftsided infective endocarditis: results from the evaluation by MRI of the brains of patients with left-sided intracardiac solid masses (EMBOLISM) pilot study. *Circulation* 2009; 120:585-591.
 16. Klein I, Iung B, Labreuche J, Hess A, Wolff M, Messika-Zeitoun D, Lavallée P, Laissy JP, Leport C, Duval X; IMAGE Study Group. Cerebral microbleeds are frequent in infective endocarditis: a case-control study. *Stroke* 2009; 40:3461-3465.
 17. Duval X, Iung B, Klein I, Brochet E, Thabut G, Arnoult F, Lepage L, Laissy JP, Wolff M, Leport C; IMAGE (Resonance Magnetic Imaging at the Acute Phase of Endocarditis) Study Group. Effect of early cerebral magnetic resonance imaging on clinical decisions in infective endocarditis. *Ann Intern Med* 2010;152:497-504.
 18. Masuda J, Yutani C, Waki R, Ogata J, Kuriyama Y, Yamaguchi T. Histopathological analysis of the mechanisms of intracranial hemorrhage complicating infective endocarditis. *Stroke* 1992;23:843-850.
 19. Li JS, Sexton DJ, Mick N, Nettles R, Fowler VG Jr, Ryan T, Bashore T, Corey GR. Proposed modifications to the Duke criteria for the diagnosis of infective endocarditis. *Clin Infect Dis* 2000;30:633-638.
 20. Chang YJ, Ryu SJ, Chen JR, Hu HH, Yip PK, Chiu TF; Consensus Group of Taiwan Stroke Society. Guidelines for the General Management of Patients with Acute Ischemic Stroke. *Acta Neurol Taiwan* 2008;17:275-294.
 21. Taiwan Guidelines for the Management of Stroke. 2008:77.
 22. Tan M, Armstrong D, Birken C, Bitnun A, Caldarone CA, Cox P, Kahr W, Macgregor D, Askalan R. Bacterial endocarditis in a child presenting with acute arterial ischemic stroke: should thrombolytic therapy be absolutely contraindicated? *Dev Med Child Neurol* 2009;51:151-154.
 23. Ribó M, Molina C, Alvarez B, Dinya L, Alvarez-Sabin J, Matas M. Buying time for recanalization in acute stroke: arterial blood infusion beyond the occluding clot as a neuroprotective strategy. *J Neuroimaging* 2009;19:188-190.
 24. Ribo M, Rubiera M, Pagola J, Rodriguez-Luna D, Meler P, Flores A, Alvarez-Sabin J, Molina CA. Bringing forward reperfusion with oxygenated blood perfusion beyond arterial occlusion during endovascular procedures in patients with acute ischemic stroke. *Am J Neuroradiol* 2010;31: 1899-1902.