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ORIGINAL ARTICLE

Clinical experience of infective endocarditis complicated by acute cerebrovascular accidents

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Summary *Background/Objective:* To evaluate the clinical results of patients with infective endocarditis (IE) complicated by acute cerebrovascular accidents (CVAs).
Methods: A total of 44 patients with IE complicated by CVA at admission were retrospectively analyzed in a single medical institute from 2005 to 2011. At the time of admission, 18 patients were diagnosed with hemorrhagic stroke, and 26 patients were diagnosed with ischemic stroke. Fifteen patients received surgical intervention during hospitalization.
Results: The hospital mortality rate was 38.9% for the hemorrhagic stroke group and 42.3% for the ischemic stroke group ($p = 0.821$). The mortality rate was 33.3% for the surgical group and 44.8% for the nonsurgical group ($p = 0.531$). At 30 days of hospitalization, 45.8% of the patients experienced an adverse event (defined as death due to organ failure, restroke, cardiogenic shock, or septic shock during the treatment period), and the attrition rate was 1.5% per day. Surgery performed after the adverse events increased mortality (80.0%) compared with surgery performed on patients with no adverse events (10.0%; $p = 0.017$). A Cox regression analysis revealed that creatinine > 2 mg/dL, diabetes, and staphylococcal infection were the risk factors of the adverse events.
Conclusion: Early surgical intervention for IE with ischemic stroke may prevent adverse events, particularly in patients with impaired renal function, diabetes, or staphylococcal infection. A delay in operation of > 30 days is recommended after hemorrhagic stroke.

Conflict of interest: None declared.

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1. Introduction

Over the past decade, infective endocarditis (IE) has caused significant morbidity and mortality despite the evolution of antimicrobial therapy and the refinement of surgical techniques.[1] Infections involving the valve leaflets, endocardium, chordae, tendineae, and even artificial intracardiac materials lead to numerous complications, such as valvular incompetence, embolization, congestive heart failure, and cerebrovascular accidents. Among the various detrimental complications, neurologic complications in patients with endocarditis are the most challenging problems to address[2,3] because of the conflicting nature of their pathophysiology (i.e., an embolic event with hemorrhagic transformation) and the potentially fatal outcome of cardiac surgery under cardiopulmonary bypass.[4] Recent studies have shown that early surgical intervention may prevent further complications.[4–7] Although emergent surgical indications for IE patients with repeated cerebrovascular accidents (CVAs) have been well established, the timing of the surgery and its prognostic impact on IE patients are still controversial. In this study, we analyzed 44 patients with active IE combined with new-onset CVA admitted to one medical institute over the past 6 years during hospitalization to evaluate the clinical outcomes and the complication rate during the waiting period.

2. Methods

Between January 1, 2005, and May 31, 2011, a total of 525 diagnosed IE cases were admitted to one single medical institute. Among them, 44 patients with active IE and new-onset CVA for possible surgical intervention were enrolled. All patients met the modified Duke criteria for definite or possible endocarditis.[8] No patient who was initially included was excluded from the analyses after the initial assessment.

2.1. Clinical data

The following clinical and biological parameters were prospectively collected at the time of diagnosis and during hospitalization: age, gender, comorbidity, diabetes, serum creatinine level, location of involved valves, pre-existing prosthetic valve, presence of hemorrhagic stroke, and initial Glasgow Coma Scale (GCS). GCS impairment was defined by a GCS score ≤ 7 for those with endotracheal intubation or a GCS score ≤ 12 for those without. The diagnosis of CVA was based on clinical diagnoses and confirmed through computed tomography (CT). CVA was classified as ischemic or hemorrhagic according to the initial CT scan. Ischemic stroke was defined as the persistence of a focal neurologic deficit caused by altered circulation in the cerebral hemispheres, brain stem, or cerebellum for 24 hours with or without CT or magnetic resonance imaging (MRI) documentation. Hemorrhagic strokes included primary intracerebral hemorrhage, hemorrhagic infarction, and subarachnoid hemorrhage. Any hemorrhagic transformation noted during admission was recorded and placed the patient in the hemorrhagic group. The diagnosis of CVA was confirmed during the same hospitalization period by an experienced neurologist based on clinical signs or imaging evidence. Transthoracic or transesophageal echocardiography was performed in all cases to evaluate cardiac function and determine the location of the involved heart valves. The treatment was at the discretion of the patient's treating physician. Adverse events included clinical situations, such as death, restroke, and shock (either cardiogenic or septic). Death due to chronic CVA sequelae was counted as "censor" instead of "death." Restroke was defined as a new focal neurologic deficit with focal or lateralizing signs on physical examination and with CT confirmation during admission. Cardiogenic shock was defined as needing inotropic medication to maintain the mean arterial pressure above 65 mmHg, oliguria, or lung congestion requiring an oxygen mask to maintain SaO2 over 90%. Septic shock was defined as the presence of systemic inflammatory response syndrome plus signs of end-organ dysfunction. For patients who had undergone surgery for either ischemic or hemorrhagic stroke, days to operation were summarized and compared.

2.2. Statistical analysis

Numeric data were expressed as the mean $\pm$ standard deviation. The frequencies of simple events were reported as simple percentages. Differences between groups were compared using Student's t test, the Mann–Whitney U test, or the Chi-square test according to the data type. Follow-up events of death and adverse events were analyzed using a Kaplan–Meier survival curve and compared using Cox regression tests. Variables with $p < 0.1$ according to univariate analysis were included in the multivariate analysis, which was performed with a backward Wald test with an entry probability of 0.1 and a removal probability of 0.1. For all statistical evaluations, differences in data with $p < 0.05$ were considered significant, and $p < 0.1$ was considered a trend. All statistical analyses were performed using MedCalc version 12 (MedCalc Software, Ostend, Belgium).

3. Results

A total of 44 patients who met the Duke criteria for IE combined with CVA at the time of admission were enrolled in the present study, including 26 patients with ischemic stroke and 18 patients with hemorrhagic stroke. Three cases of hemorrhagic transformation were included during the same admission. All three transformations happened within 36 hours of admission. The baseline demographic and clinical characteristics of the patients are summarized in Table 1. In brief, diabetes was present in 22.2% and 23.1% of patients in the hemorrhagic and ischemic groups, respectively ($p = 0.973$). Staphylococcal infections were identified in 38.9% and 34.6% of patients in the hemorrhagic and ischemic groups, respectively ($p = 0.772$).

The clinical outcomes are summarized in Table 2. Adverse events during hospitalization were also recorded. Restroke occurred in nine of 44 cases (20.5%), septic shock in seven of 44 cases (15.9%), and cardiogenic shock in two of 44 cases (11.4%). Operations were performed for seven patients in the hemorrhagic group (38.9%) and eight patients in the ischemic group (30.8%; $p = 0.576$). Overall in-hospital mortality was