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Factors Related to Postoperative Delirium in Patients with Lower Limb Ischaemia: A Prospective Cohort Study

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WHAT THIS PAPER ADDS?

- Postoperative delirium (POD) is associated with severe obstacles to effective nursing care, prolonged recovery times, and longer stays in the intensive care unit, resulting in higher morbidity and mortality. Investigations have spanned various surgical fields over the past half-century, but reported risk factors for the development of POD vary, likely because of the heterogeneity of study cohorts. The current prospective cohort study identified five definitive risk factors for POD in patients undergoing bypasses for limb ischaemia. Predicting the candidates for close postoperative monitoring and interventions to prevent or mitigate POD will benefit the nursing staff and clinicians caring for patients.

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ABSTRACT

Objectives: To preoperatively determine candidates at definitive risk of postoperative delirium (POD), we identified relevant factors in patients with arteriosclerosis obliterans who underwent bypass surgery.
Design: A prospective cohort study.
Patients and methods: 299 patients (age ≥60 years) who underwent bypasses in 1995–2006 were enrolled. Cognitive impairment was assessed by the Revised Hasegawa Dementia Scale, the Confusion Assessment Method was also used, and severity was graded as Grade I–III (mild to severe) based on the Delirium Rating Scale. All patients were followed for 3 years.
Results: POD occurred in 88 patients (29%), with a median age of 75 (10) years (IQR). Onset was 2 (1) days postoperatively, and a duration of 2 (2) days was observed. POD was hyperactive in 89% and was Grade I, II, and III in 11%, 68%, and 21% respectively. Multiple logistic regression analysis identified the following risk factors for POD: age ≥72 years (<0.0001), end-stage renal failure (0.001), multiple occlusive lesions (<0.0001), cognitive impairment (0.003), and critical limb ischaemia (0.034). The 3-year survival rate was similar when comparing POD and non-POD patients (84% vs. 88%, NS).
Conclusions: This study identified 5 risk factors for POD in patients undergoing bypasses for limb ischaemia. Long-term outcomes were similar when comparing the patients who experienced POD with those who did not.

Introduction

Delirium is defined as a transient organic mental syndrome of acute onset, which predominantly occurs in elderly patients who are seriously ill. Postoperative delirium (POD) is associated with severe obstacles to effective nursing care, prolonged recovery times, and longer stays in the intensive care unit, resulting in higher morbidity and mortality as well as higher costs of care.

Concern about these negative consequences has led to widespread investigation of the clinical characteristics of POD, the relevant risk factors, and the outcomes of patients with POD.

Investigations have spanned various surgical fields, including orthopaedic surgery,[1–3] cardiac[4–7] and vascular surgery,[8–10] urology,

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and gastrointestinal surgery, over the past half-century. Regardless, the pathophysiological mechanisms surrounding POD remain poorly defined.

Common predisposing factors for POD include old age and cognitive impairment; these factors have been validated within various cohort studies.[1,2,8,10–13] However, the incidence and significance of other risk factors remain unclear, in part because of the heterogeneity of clinical cohorts.[14] In 1994, our group conducted a preliminary study in patients undergoing vascular surgery that demonstrated a higher incidence of POD in elderly patients undergoing arterial bypasses for critical limb ischaemia (CLI) than in patients undergoing other types of procedure (e.g. arterial bypass for claudication, aortic replacement for abdominal aortic aneurysm). As a follow-up to these observations, our group initiated a cohort study in April 1995.

Interim analysis showed that the incidence of POD was high (42%) in patients over 70 years and CLI was identified as a specific risk factor for POD.[8] The goal of the present study was to identify other risk factors for the development of POD in elderly patients undergoing arterial bypass surgery for chronic lower limb ischaemia.

Patients and Methods

Study design

This was a prospective cohort study designed to identify risk factors for the development of POD in elderly patients with chronic lower limb ischaemia due to arteriosclerosis obliterans (ASO) who underwent elective bypass surgery. The preliminary study was initiated in 1994, and this cohort study was initiated in 1995. Enrolment was finished in 2006, and the final three-year follow-up was completed in March 2009. The ethics committee in the Asahikawa Medical University was not formed until 2005, and thus institutional ethical approval for this study protocol was not obtained.

ASO patients

Between April 1995 and March 2006, 490 consecutive ASO patients underwent bypasses at Asahikawa Medical University Hospital and were screened for participation in the study. Inclusion criteria were as follows: age $\geq$60 years, symptomatic ASO manifesting as disabling claudication, rest pain or ischaemic tissue loss, and suitability for elective bypass surgery. Of 490 patients, 95 were excluded because of the unavailability of a preoperative interview as a result of a profound mental disorder, critical illnesses, or a simultaneous operation for associated diseases. The remaining 395 patients were invited to participate in the study, and 299 patients ultimately consented to participate and were enrolled. The procedures for 299 patients included 259 conventional bypasses, 27 extra-anatomic bypasses, and 13 hybrid operations consisting of simultaneous infrainguinal bypass and balloon angioplasty for iliac artery lesions. Seventeen underwent revision surgery in the early postoperative phase for vein graft thrombosis.

Assessment for preoperative cognitive status

After enrolment and before surgery, cognitive status was assessed in all patients using the Revised Hasegawa Dementia Scale (HDS-R), which is comparable to the Mini-Mental State Examination. The method for assessment by HDS-R has been previously described;[8] the HDS-R consists of nine questionnaires with a scale of 0–30. A score of 20 or less indicates mild cognitive impairment.

Assessment for POD

All patients were admitted to the intensive care unit or high care unit after surgery, and postoperative status was carefully screened by nursing staff and documented in daily nursing records. The Confusion Assessment Method (CAM)[15] was applied to borderline patients to determine whether delirium was present. In addition, delirious patients were classified into three subtypes: hyperactive, hypoactive, and mixed type. The severity of POD was assessed by modified assessment criteria based on the Delirium Rating Scale (DRS)[16] and classified as Grade I–III (mild, moderate, and severe) (Table 1).

Relevant factors for POD

Patient characteristics were recorded (Table 2). Specific factors related to bypass surgery included severity of ischaemia, extent of arterial occlusion, and bypass procedures. Severity of limb ischaemia was dichotomised between claudication, rest pain, and gangrene/ulcer, and between claudication and CLI (including rest pain with ankle pressure $<$50 mmHg and tissue loss with $<$70 mmHg in TASC-II criteria[17]).

Patients with incompressible arterial calcification were sorted according to their clinical manifestations. Other parameters included methods of anaesthesia, intraoperative transfusion, operative time, early reoperation because of graft thrombosis, and results from routine preoperative laboratory tests (Table 3).

Follow-up for outcome

All patients underwent follow-up for 3 years after surgery (at 3-month intervals for the first 2 years and every 6 months thereafter) to assess bypass graft patency and outcomes. Cognitive status was also serially assessed in patients who rated lower than 21 in preoperative HDS-R testing. These patients underwent repeat HDS-R testing every 6 months for 3 years or until their scores improved to reach the normal range.

Statistical methods

All statistical analyses were performed using the statistical software package SPSS version 11.5 (SPSS Inc., Chicago, IL, USA). Estimation of continuous and categorical variables was performed using medians (interquartile rage: IQR), and percentages.

Age and operative time were dichotomised by constructing receiver-operating characteristic curves at 72 years and 376 min, respectively, whereas the other variables were dichotomised by their respective standards or normal values. All variables were

Table 1
Categories and respective criteria for severity of delirium.

Grade	I (Mild)	II (Moderate)	III (Severe)
Awareness of own medical state	Yes	No	No
Cognitive deficits	No–Yes	Yes	Yes
Lability of mood	No–Yes	Yes	Yes
Altered speech and/or behaviour[a]	1–2 times	Several	Frequent
Management			
Nursing care level	Careful	Very careful	Intensive
Coaxing	Often	More often	Repeatedly
Restraints	No	No	Use
Medication	No	No	Rarely

[a] When abnormal speech and/or dangerous behaviours due to perceptual disturbances, illusions, hallucination, and/or delusions are recognised; Coaxing, persuading the patient to stop dangerous behaviours, such as pulling out intravenous lines or gastric tube, or leaving bed; Restraints, physical restraints to prevent dangerous behaviour; Medication, haloperidol was used.