

CASE REPORT

A Patient with Perioperative Circulatory Cerebral Infarction. Case Presentation and Literature Review

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ABSTRACT

Objective: To explore the risk factors and preventive countermeasures of perioperative cerebral infarction.

Methods and results: We reviewed the clinical medical records and anesthesia process of a perioperative stroke patient and reviewed the literature.

Discussion: Perioperative stroke is the result of a combination of multiple factors. Medical complications such as long history of hypertension, diabetes, history of stroke and extreme low head during laparoscopy are risk factors for stroke.

Conclusion: Laparoscopic surgery should monitor high risk factors, maintain intraoperative hemodynamic stability, hidden symptoms of posterior circulation cerebral infarction, and pay early identification and timely intervention to improve the prognosis of patients.

Keywords: perioperative, posterior circulation, cerebral infarction, risk factors.

INTRODUCTION

Perioperative stroke is a serious complication of surgery, which not only prolongs hospitalization but also increases the surgical mortality rate. At present, there are many reports on circulatory infarction before stroke and few reports on circulatory cerebral infarction (1, 7). The authors retrospectively analyzed the clinical data of a patient with perioperative circulatory cerebral infarction combined with relevant references, and summarized the etiology, risk factors and

clinical characteristics of such patients for readers' reference. □

METHODS AND RESULTS

Case data

A 63-year-old female patient, height 163 cm, weight 85 kg and BMI 32 kg/m², was admitted for "menopause for 20 years, vaginal bleeding for two months, found pelvic mass for one day"; menopause 20 years ago, dark red vaginal bleeding, less amount, not paid attention to. One

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Article received on the 8th of May 2023 and accepted for publication on the 30th of August 2023

month prior to presentation she had abdominal distension, poor appetite and vaginal bleeding.

Physical examination: body temperature 37.1 °C, blood pressure (BP) 159/89 mm Hg, respiratory rate 22 breaths/minute, heart rate (HR) 59 times/minute, rhythm, consciousness, answer, moderate nutrition, S1 of cardiac aortic valve, non-mobile lower abdominal percussion, and positive ulnar pressure test.

Medical history: hypertension for seven years, 5 mg felodipine extended-release tablets one time/day, orally, unknown control; diabetes for seven years, insulin for 8U, subcutaneous injection, one time/day; three years of cerebral infarction, admission to a local hospital, currently stopped aspirin, 0.8 g cephalon capsule three times/day, orally.

History of surgical anesthesia: laparoscopic cholecystectomy in our hospital four years ago.

Laboratory tests: WBC 4.40 $10^9/L$, RBC $4.45 \times 10^{12}/L$, HGB 136 g/L, PLT $112 \times 10^9/L$, fibrinogen content (FIB) 2.24 g/L, prothrombin time (PT) of 12.27 seconds, PT international standardized ratio (IRN) 1.02, activated partial thromboplastin time (APTT) 34.76, thrombin time (TT) 9.87; ALT 12 U/L, AST 26 U/L, AST/ALT 2.05, hypersensitive C-reactive protein (hs-CRP) 40.15 mg/L, triglycerides (TG) 2.8 mmol/L, low-density lipoprotein (LDL-c) 3.73 mmol/L, apolipoprotein B 1.26 g/L, serum total protein (TP) 54.79 g/L, albumin (ALB) 34 g/L, globulins (GLO) 25.13 g/L; no obvious abnormality in water electrolytes; blood glucose and fructosamine were not abnormal; tumor glycoclass antigens, including CA-125 37.53 U/mL and CA-199 14.80 U/mL, were all significantly increased, CEA 0.78 U/mL, AFP 1.01 U/mL; ECG: sinus rhythm, ST-T changes. Pulmonary function was not checked.

Preoperative abdominal ultrasound examination: large mixed mass of abdominal and pelvic cavity (250–110 mm), slightly larger uterus with intimal thickening.

Cardiac color ultrasound: the LV systolic function was reduced, and the ejection fraction was 51%. The ASA grade was evaluated for preoperative anesthesia.

Admission diagnosis: 1) the nature of the huge pelvic mass remains to be determined (ovarian tumor?); 2) diabetes (type); 3) hypertension (period); 4) old cerebral infarction; 5) dyslipidemia.

Proposed laparoscopic abdominal-pelvic exploration plus mass resection was performed.

Anesthesia

On 15 December 2017, routine monitoring of the patient without preoperative medication showed BP 151/102 mm Hg, HR 64 times/min, SpO₂ 96% and PetCO₂ 37 mm Hg. Upper limb venous access was open, and radial artery puncture was inserted under local anesthesia to monitor invasive arterial blood pressure. Sequential induction with midazolam 0.05 mg/kg, sufentanil 0.4 µg/kg, propofol 1.5 mg/kg and rocuronium 1.0 mg/kg, air tube intubation, intraoperative mechanical ventilation, tidal volume 6–8 mL/kg, respiratory rate 12–16 times/min, inhalation ratio 1:2, PetCO₂ maintained in the range of 35–45 mm Hg. Propofol 3–6 mg/kg/h and remifentanyl 0.1 µg/kg/min were continuously injected to maintain anesthesia, EEG double frequency index (BIS) was monitored throughout the BIS value between 40 and 60, and rocuronium was injected intermittently. Intraoperative pathology suggested ovarian borderline mucinous cystadenoma, with some cells growing actively. After informing the patient's family members of the condition and obtaining their understanding, under laparoscopic total uterus + bilateral tubal resection, the intraoperative blood pressure changes were as follows: 105/65–93/49 mm Hg, the average arterial pressure was the lowest 65 mm Hg, the cumulative duration was about 10 minutes, SpO₂ changed between 96% and 99%, and there was no obvious abnormality in the two intraoperative blood gas analysis. Intraoperative bleeding was about 600 mL, 1700 mL rehydration, with 500 mL colloid and 1200 mL crystal. The operation lasted for four hours and 50 minutes, and was completed at 14:20 pm. Thirty minutes after surgery, the patient recovered spontaneous breathing, agitation, not tube resistance, conventional small dose of antagonistic muscle relaxation; three minutes later, the eyes were opened, muscle strength was level 4, air absorption for 10 minutes, SpO₂ 96%, and the endotracheal tube was removed. Mask for oxygen inhalation of SpO₂ 99%. After 10 minutes, limb muscle strength was normal, two limb muscle strength, but consciousness, two eyes to the right gaze, eye level movement was normal, abnormal, loudly can slightly open eyes, difficulty, occasionally groan, during two blood gas analysis was normal, MAP 95–111 mm Hg, HR 75–96 times/minute, SpO₂ 96–99%. A recheck at 16:20 pm showed that consciousness

recovery was still not satisfied, on both sides of the smaller pupil, considering the residual effects of opioids, to naloxone 0.2 mg, flumazenil 0.3 mg static injection, observation for five minutes, the symptoms and signs of no improvement, emergency contact neurology consultation, physical examination consultant could not clear after nerve positioning signs, regardless of stroke. The CT room was notified for an urgent head CT scan, which indicated that cerebral infarction could not be ruled out. As whole cerebral angiography could not be performed in our hospital, the patient was sent to the intensive care unit for observation. At 22 pm, the patient had difficulty breathing independently and the oxygen saturation was difficult to maintain, with controlled ventilation for endotracheal intubation. The magnetic resonance imaging (MRI) findings on the first postoperative day were as follows: the long T1 and T2 signals were seen in the right thalamus and temporoparietal lobe, brainstem and bilateral cerebellar hemisphere, and the left cerebellar middle foot; and the left cerebellar middle foot (Figure 1). Multidisciplinary consultation was proposed to lower treatment strategy: 1) general treatment included blood pressure control, mechanical ventilation, blood glucose conditioning and management complications; and 2) specialist treatment package early thrombolysis therapy, antiplatelet therapy, anticoagulant therapy and early individualized rehabilitation therapy. After one month, the new CT scan revealed low-density shadow of the right temporoccipital-parietal lobe and bilateral

cerebellar hemisphere, and the large boundary of some lesions was unclear and no obvious occupying effect. The imaging diagnosis was basically the same as the former. The clinical diagnosis was cerebral awake coma. Patient's transfer to the rehabilitation sports medicine department for further treatment after tracheotomy was recommended. □

DISCUSSION

Perioperative stroke refers to a cerebral hemorrhage or ischemic infarction occurring during or within 30 days after surgery. At present, most literature reports show that the incidence of perioperative stroke in non-cardiovascular and non-brain surgery is about 0.1%, and is often found in general surgery, head and neck surgery and bone and joint surgery (1), while gynecological laparoscopic uterine surgery stroke is rarely reported. With the development of laparoscopic surgery and the continuous breakthrough of the surgical exclusion area, there may be more cases described in the literature. This paper witnessed a rare case of large cerebellar infarction in the posterior circulation, which was sufficient to cause a warning.

Kim M *et al* (2) conducted a retrospective analysis of patients with non-neurosurgical non-cardiovascular surgery, and found that the American Association of Anesthesiologists (ASA) classification, history of stroke or TIA, insulin control, and preoperative anemia were the main risk factors. Our patient had a history of hypertension for seven years, diabetes treated with insulin, and cerebral infarction three years ago, indicating that the risk factors of preoperative patients were an important basis for perioperative stroke.

Previous studies confirmed that hypertension was a high risk factor for stroke. For example, Jin Zhe's study (3) shows that hypertension in patients with cerebrovascular autoregulation ability was reduced, the intraoperative anesthesia hypotension tolerance was poor and could not guarantee sufficient blood flow and oxygen supply, easy to form ischemic stroke – so, perioperative blood pressure control management is crucial in older patients. Nouh A (4) also believe that intraoperative hypotension may be a risk factor for peristroke. This case history of hypertension for many years, intraoperative time



FIGURE 1. Large midfoot cerebral infarction in the right thalamus and temporoparietal lobe, brainstem and bilateral cerebellar hemisphere, and left cerebellum

about 10 minutes of hypotension state, processing not timely follow up, the cerebral blood flow significantly reduced, and the brain circulation blood only 1/4–1/3 of the whole brain blood supply, and artery morphology often abnormal changes such as stenosis, aneurysm formation, distortion, transverse, slender, compression, due to the brain tissue is sensitive to ischemia, all lead to cerebral infarction, and circulation symptoms hidden, can directly lead to central respiratory circulation failure, which is a life-threatening condition.

The posterior circulation is the vertebrobasilar artery system, consisting of the basilar artery, vertebral artery, and posterior cerebral artery, which mainly supplies areas to the brainstem, cerebellum, occipital lobe, posterior 4/5 of the thalamus, the medial temporal lobe and other posterior cerebral arteries (PCA). Although there are many similarities between the anterior and posterior circulation cerebral infarction, the posterior circulation cerebral infarction still has its special manifestations. Tao WD (5) performed the analysis of a group of inpatients with posterior circulatory cerebral infarction, whose main features were dizziness/vertigo and limb weakness in 69.1% and 47.3% of subjects, respectively, while consciousness disturbance was found in only 10.9% of patients. These subjective atypical symptoms during general anesthesia surgery can easily cause misjudgment along the recovery period of anesthesia. In this case, there was no significant difference in muscle strength above grade 4 during extubation. There was a loud response, no significant disturbance of consciousness, mistaken for a normal state during the waking phase of anesthesia, so that it has lost the golden time of early diagnosis and early treatment. As for physical signs such as ocular mobility disorders (12.7%) and Horner sign (7.3%), although the incidence rate is also low, but it is the characteristic clinical manifestation of posterior circulation cerebral infarction. According to the study, in a group of non-surgical stroke misdiagnosis cases, the proportion of patients with manifestations of nystagmus was 63.46%. The patient also developed some degree of ocular movement disturbance during the tracheal extubation. In the recovery phase of anesthesia, the result is a missed diagnosis. The study performed by Hsieh JK (6) showed that acute posterior circulatory cerebral infarction was mainly arteriole

occlusion clinically, most subjects had a high expression of homocysteine (Hcy) and LDL-C, with Hcy, hs-CRP and LDL-c being the risk factors for the onset of acute posterior circulatory cerebral infarction. The preoperative biochemical findings of this patient (hs-CRP 40.15 mg/L and LDL-c 3.33 mmol/L) may indicate the ongoing cerebrovascular inflammation response and the pathophysiological signal of cerebrovascular wall injury in the early stage of cerebral infarction.

Studies (5-8) showed differences in types of surgery, surgical complexity and causes of perioperative stroke. The high risk factors for non-laparoscopic cerebral infarction in general surgery, such as cholecystectomy, are the drastic hemodynamic fluctuations during the perioperative period, including intraoperative arrhythmia, intraoperative hypertension or hypotension. Research (8) showed that, with the development of minimally invasive surgery, long time pneumoperitoneum on physiological has been more and more affected by clinical attention, long time gas abdomen low head, abdominal pressure, intracranial pressure, cerebral blood reflux, cerebral perfusion, cerebral blood flow reduction, would have obvious negative effects on cerebral oxygen saturation, especially in patients with original brain disease, which would further trigger brain tissue ischemic infarction.

Related studies (9, 10) show that the incidence of deep vein thrombosis (DVT) is as high as 19.6%-38.0%, with elderly, obesity, hyperglycemia, malignant tumor, operation time, and intraoperative blood loss being more risk factors of perioperative thrombosis, and DVT, in addition to cause pulmonary embolism by abnormal embolus through the orifice into the circulation of ischemic stroke has been reported. In our case, the patient was obese, suffering from ovarian tumors, medical complications such as old history of hypertension and diabetes, history of stroke, extreme low postoperative head, pneumoperitoneum of nearly five hours and operation time were negligible risk factors for stroke. □

CONCLUSION

To sum up, compared with inpatient early recognition of ischemic stroke, anesthesia surgery, especially in general anesthesia patients, early screening is more special, given the perio-

perative stroke is the result of multiple factors together; especially the symptoms of posterior circulation cerebral infarction are hidden and not easy to identify; in addition to the existing high risk factors, some biochemical indicators such as Hcy, hs-CRP and LDL-c could be predictors of posterior circulation cerebral infarction

and should be given more attention, and eye movement abnormalities in the operating room anesthesia may be beneficial hints. □

Conflicts of interest: none declared.

Financial support: none declared.

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