

## Microvascular disturbance after radial artery catheterizations in a patient with polycythemia vera

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Arterial catheterization is an invasive technique commonly used for continuous monitoring of arterial blood pressure and for analysis of arterial blood gases. Arterial catheterization is a relatively safe procedure; however, vascular occlusion and ischaemia is a known complication of the procedure. We experienced a case of microvascular disease in the hand of a patient who underwent radial artery catheterization and was diagnosed with polycythemia vera during treatment.

**Keywords:** Arterial catheterizations; ischaemia; postoperative complication; primary polycythemia

### Introduction

Arterial catheterization is an invasive technique commonly used for continuous monitoring of arterial blood pressure and for analysis of arterial blood gases. A prospective study of the radial artery after catheter insertion showed a reduction in blood flow in 27.5% of patients, and loss of pulse in 10%, but ischaemia did not occur.<sup>1</sup> In another study, the incidence of ischaemia in the hand was less than 0.1% after radial artery catheter insertion, but most of the cases were severe and had poor prognosis.<sup>2</sup> We present the case of a patient with a digital microvascular disturbance following radial artery catheterization.

### Case Report

A 54-year old woman with a left kidney cyst presented for laparoscopic cystectomy. Preoperative examination revealed pancytosis, haemoglobin of 18.7gm/dL, haematocrit of 55.9%, platelet count of 387,000/mm<sup>3</sup>, and white blood cell count of 16,190/mm<sup>3</sup>. As the patient had no specific symptoms or concerning signs, we decided to proceed with the surgery and to perform further evaluation if necessary after surgery. Intubation was performed for general anaesthesia. Allen's test was performed to confirm collateral circulation of the right radial artery, and an arterial catheter was inserted in one attempt. There was no excessive bleeding or hypotension during surgery, and the arterial catheter was removed immediately before extubation as bleeding was controlled.

On the 3rd postoperative day, the patient developed right fingertip pain, but as this was mild no specific measures were taken. On the 14<sup>th</sup> postoperative day, she complained of burning sensation, redness (Figure 1), and swelling of the right thumb. The patient received a third-generation cephalosporin antibiotic and analgesics for suspected cellulitis on outpatient orthopaedic follow-up.

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She was admitted for further evaluation due to lack of improvement after a week of treatment. There were no abnormalities on ultrasonographic examination of the right hand. Laboratory studies demonstrated pancytosis, haemoglobin of 18.3g/dL, haematocrit of 57.0%, platelets count of 369,000/mm<sup>3</sup>, and a white blood cell count of 17,200/mm<sup>3</sup>. Pancytosis was suspected to be due to polycythemia vera (PV), and bone marrow biopsy and genetic tests were performed. At the same time, gabapentin, beraprost, and aspirin were prescribed in pain clinic for pain control and treatment, and a right-side stellate ganglion block (SGB) was performed. Bone marrow examination revealed hyper cellularity. Genetic testing confirmed *JAK2-V617F* mutation and PV, and hydroxyurea was started. She continued the drug for 3 weeks and underwent a total of 10 right SGBs. The patient was discharged after resolution of finger pain and swelling.



**Figure 1.** Redness developed in the right thumb 14 days after ipsilateral radial artery catheterization.

### Discussion

The diagnosis of PV followed the World Health Organization criteria published in 2016. The patient in this case met 3 major criteria (haemoglobin >16.0g/dL, bone marrow biopsy showing hypercellularity, and presence of *JAK2-V617F* and PV was

confirmed. PV may present with nonspecific symptoms such as fatigue (91.7%) itching (65%), early satiety (62.1%), weight loss (36.2%), and fever (17.9%).<sup>3</sup> Mild pancytosis was noted preoperatively, but there were no other symptoms, and the operation proceeded without further evaluation. The median survival of patients with PV is more than 18 years, and the quality of life is decreased due to complications related to thrombosis and bleeding rather than death due to disease.<sup>4</sup> Therefore, lowering the risk of complications is the goal of treatment.

In addition to PV, essential thrombocytosis, chronic myelogenous leukaemia and primary myelofibrosis are categorized as myeloproliferative neoplasms (MPNs). All have thrombotic complications, although there are differences in frequency.<sup>4</sup> In addition, if hypotension occurs during surgery, a vasopressor is used, and cannulation duration is prolonged, the likelihood of thrombosis increases.<sup>5</sup> Disseminated intravascular coagulation, hypolipoproteinaemia, and heparin-induced thrombocytopenia also increase the risk.<sup>6</sup>

In patients with increased risk, sufficient explanation and confirmation of collateral circulation and careful procedures are required before the procedure. A pulse oximeter can be placed in the ipsilateral hand to aid in early detection. It may also be helpful to monitor vascular status if the procedure hand is not covered by the surgical drape. However, since there is no definite way to prevent thrombus formation, early detection and intervention with continuous monitoring of the circulation are recommended. If thrombosis causes ischaemia in the hand, the patient may complain of pain, sensory disturbances, and changes in skin color. If ischaemia or embolism is suspected, a change in blood flow should be checked by palpation of the vascular pulse or use of a doppler device.

Although not done in this case, angiography can identify the occluded vessel for direct injection of heparin.

It is not clear which treatment is best and treatment should be provided according to the patient's status. If arterial occlusion is detected early, ipsilateral ulnar artery compression may be helpful for reperfusion by increasing the flow and velocity in the occluded artery.<sup>7</sup> Pharmacologic therapies include intravenous injection of vasodilating agents such as phentolamine, verapamil, and diltiazem, which are effective in patients with symptomatic arterial occlusion and vasospasm.<sup>8</sup> SGB dilates the blood vessels of the upper extremity and increases blood flow. It also helps control pain caused by vascular disease in the upper extremity.<sup>9</sup> In this case, a total of 10 SGBs were performed, and the patient had pain relief. If the effectiveness of other treatments is poor, surgical treatment such as thrombectomy or angioplasty may be necessary. When thrombosis occurs in patients with an MPN such as PV, low dose aspirin (100mg/day) is helpful for treatment and pain relief.<sup>10</sup>

In conclusion, in patients with an MPN, thromboembolic risk may be increased. Therefore, if the disease is suspected before surgery, thorough evaluation should be performed. It is necessary to confirm collateral circulation before the procedure, and careful evaluation and continuous monitoring of blood flow are required.

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