

Case Report

Percutaneous cardiopulmonary support for pulmonary thromboembolism caused by large uterine leiomyomata

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Abstract

Objective: Acute pulmonary thromboembolism (PTE) is a common illness that causes death and disability. Deep vein thrombosis (DVT) is often found in patients with a large myomatous uterus, and can occasionally result in acute PTE. Here, we describe the achievement of a favorable outcome in a case of acute PTE.

Case Report: The patient presented with acute PTE caused by a large uterine leiomyoma, without DVT of the lower extremities. Percutaneous cardiopulmonary support (PCPS) was used as an adjunct to thrombolytic therapy to treat the right ventricular thrombus with acute PTE. According to emergency practice, PCPS was initiated, and the patient was successfully treated with thrombolytic and anticoagulant therapy associated with total abdominal hysterectomy.

Conclusions: This case suggests that PCPS can lead to favorable clinical outcomes in patients with large uterine leiomyomata and severe PTE. Copyright © 2012, Taiwan Association of Obstetrics & Gynecology. Published by Elsevier Taiwan LLC. All rights reserved.

Keywords: deep vein thrombosis; percutaneous cardiopulmonary support; pulmonary thromboembolism; uterine leiomyomata; venous thromboembolism

Introduction

Uterine leiomyoma arises from smooth muscle. It is one of the most common benign pelvic tumors of the female genital tract, and is likely to be the most common type of soft tissue tumor. The incidence of leiomyoma far exceeds the frequency of clinical problems, with as many as 50% of women having identifiable fibroids at menopause [1]. Symptoms of leiomyomata are location dependent; small leiomyomata may cause life-threatening uterine bleeding and disabling dysmenorrhea, whereas, very large leiomyomata may result in

few symptoms. On rare occasions, large uterine leiomyomata may cause venous thromboembolism (VTE) because of compression of the surrounding structures [2–5].

VTE, which includes pulmonary thromboembolism (PTE) and deep vein thrombosis (DVT), is a common, well-recognized surgical complication [6]. The overall incidence of PTE has been reported to be approximately 0.4% with a mortality rate of nearly 60%, indicating that PTE is a potentially life-threatening cardiopulmonary illness [7,8]. Up to 90% of PTEs are caused by DVT of the lower extremities [9].

In the current report, we describe a patient with a large uterine leiomyoma and severe PTE, without DVT in the lower extremities, who experienced cardiac arrest and was successfully treated using percutaneous cardiopulmonary support (PCPS).

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Case report

A 40-year-old nulliparous Japanese woman was admitted to Fukuoka University Hospital for acute respiratory distress. For several years, she had experienced hypermenorrhea and had suspected the presence of an abdominal mass. During the few days before admission, she also had dyspnea on exertion. Upon admission, she had a Glasgow Coma Scale score of 15. Her blood pressure, pulse rate, and respiration rate were 150/80 mmHg, 134 beats/min and 24 breaths/min, respectively, and she had a body mass index of 21.5 kg/m². She had pallor of the palpebral conjunctiva, jugular venous distension, and a distended abdominal area, and she had mild edema of both lower extremities. An electrocardiogram showed right axis deviation of the heart with sinus tachycardia. Chest X-ray showed no specific radiological features suggesting of PTE with cardiothoracic ratio of 55.9%. Transthoracic cardiac ultrasonography showed distention of the right ventricle and flatness of the ventricular septum. In addition, transabdominal ultrasonography showed a 20-cm solid tumor in the pelvis. Laboratory findings revealed a hemoglobin level of 8.0 g/dL, and a hematocrit of 33.3%, indicating the presence of severe anemia. Other hematological parameters were within the normal range. Her coagulation profiles including fibrinogen degradation products, D-dimer, plasmin α 2–plasmin inhibitor complex, antithrombin III, protein C, protein S, lupus anticoagulant, and anticardiolipin antibody levels were also within normal limits. Arterial blood gas analysis under oxygen at 10L/min showed PaO₂ of 115 mmHg, PaCO₂ of 20.4 mmHg, pH of 7.399 and HCO₃⁻ of 12.2 mmol/L. These laboratory data suggested that the patient had pulmonary embolism.

Computed tomography (CT) of the chest and abdomen was planned to diagnose precisely the pulmonary embolism and abdominal mass. However, immediately after CT examination, the patient suddenly suffered cardiac arrest. Her systolic blood pressure and heart rate dropped to <50 mmHg and 30 beats/min, respectively, and immediate cardiopulmonary resuscitation did not induce sufficient cardiac movement. Therefore, PCPS was applied promptly in an attempt to improve cardiopulmonary function. The PCPS circuit consisted of a centrifugal pump, hollow fiber, microporous membrane oxygenator, and percutaneous thin-walled cannula.



Fig. 2. Computed tomography (CT) imaging of the abdomen. A massive amount of necrotic tissue (a) was found in the large uterine leiomyoma, which compressed the patient's inferior vena cava. The arrow indicates the depressed inferior vena cava.

The Capiiox emergent bypass system (Medtronic, Tokyo, Japan) was used. Both catheters and all blood-containing surfaces throughout the system were coated with heparin. While the patient remained conscious, 15-Fr arterial side and 18-Fr venous side cannulae were inserted into the femoral vessels under local anesthesia. Her hemodynamic condition then stabilized at a PCPS flow rate of 1.2–2.1 L/min/m². An activated coagulation time was maintained at approximately 200 s, with intravenous administration of heparin during the procedure. Her systemic arterial saturation immediately improved from 81% to 100%. Spiral CT of the chest and abdomen with contrast enhancement showed a thrombus in both pulmonary arteries and a large pelvic mass compressing both the left lateral iliac vein and bilateral common iliac veins (Figs. 1 and 2). On the basis of these findings, the patient was diagnosed as having acute severe PTE caused by a large leiomyoma.

Thrombolytic therapy was instituted using 1,350,000 U tissue plasminogen activator under PCPS treatment. In addition, anticoagulation using unfractionated heparin was also administered. Echocardiography performed a few days after

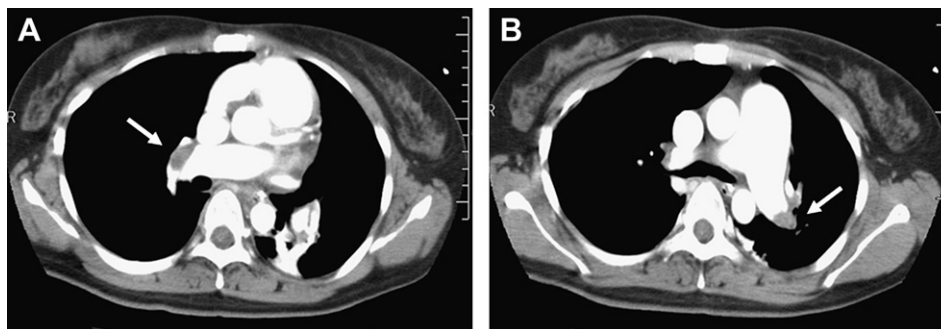


Fig. 1. Computed tomography (CT) imaging of the chest. Pulmonary embolism was present in both the right (A) and left (B) pulmonary arteries. Arrows indicate the intravascular thrombus.

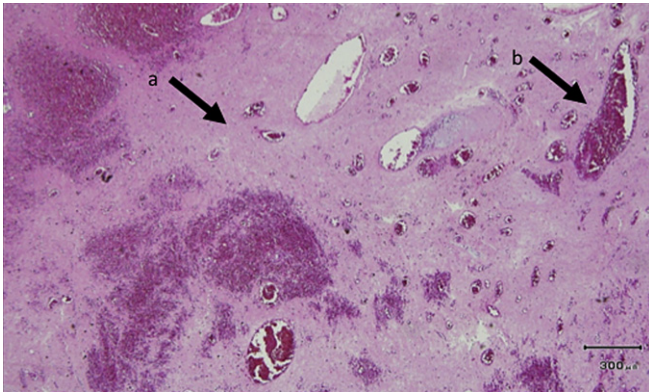


Fig. 3. Microscopic findings of the tumor showing (a) leiomyoma with massive necrosis (arrow) and (b) focal thrombosis (arrow). Magnification 4×, hematoxylin and eosin staining.

thrombolytic and anticoagulant therapy showed the disappearance of the right ventricular thrombus, indicating that these therapies were effective. Repeated echocardiography showed improvement of right ventricular function, and the cannulae were removed from her femoral vessels on the 5th day after thrombolytic therapy. On the 9th day after thrombolytic therapy, the patient's respiratory function was stabilized, and the respiration apparatus was disconnected. The patient's hemodynamics were normal (blood pressure, 112/72 mmHg; heart rate, 72 beats/min) subsequent to the completion of PCPS. On the 12th day after thrombolytic therapy, total abdominal hysterectomy was performed. The large pelvic mass weighed 2700 g and measured 22 cm × 12 cm × 11 cm. Pathological diagnosis indicated a benign uterine leiomyoma with necrosis and intravascular thrombi (Fig. 3). After the operation, she was discharged on the 55th day and was prescribed oral anticoagulant therapy for 6 months.

Discussion

From January 1998 to January 2010, four patients with large uterine leiomyomata and VTE, including the present patient (Case 4; Table 1), were treated at Fukuoka University Hospital. The current patient had many thrombi that caused extensive obstruction in several areas spanning from the left lateral iliac vein to both common iliac veins, and experienced cardiac arrest because of severe PTE. However, only the

present patient had PTE alone, without the presence of DVT. Generally, DVT is not recognized during the onset of PTE [10–12], because of inadequate sensitivity of imaging techniques for DVT, and complete embolization of thrombi from peripheral veins. Moreover, although the patient described herein had a lower body mass index and was younger than the other three patients with leiomyomata treated at our hospital, no significant differences in mass size were found. In principle, increased body mass index has a strong, linear association with the development of PTE, including idiopathic PTE (not associated with prior surgery, trauma, or malignancy) and nonidiopathic PTE in women [13]. Accordingly, it is plausible that in the current case, a large uterine leiomyoma in the small abdominal cavity directly and extensively compressed the pelvic vessels, resulting in widespread thrombi and severe PTE.

Patients with severe PTE are often affected by the failure of right ventricular function and subsequent hypoxia, resulting in cardiac shock or cardiac arrest [8,14,15]. To resuscitate patients who have experienced severe PTE and cardiac shock, there are several critical functions that must be improved, including recovery of circulation, removal of pulmonary thrombi, and improvement of underlying diseases. In general, there are two methods for recovering circulation: treating patients with surgical cardiopulmonary bypass under general anesthesia, and using PCPS under local anesthesia. PCPS is widely used as an emergency support device to prevent brain damage and multiple organ failure during heart and lung failure [16]. To remove pulmonary thrombi, thrombolytic therapy is administered and surgical pulmonary embolectomy is performed [17]. In particular, pulmonary embolectomy can save critically ill patients when thrombolysis is ineffective or when patients have acute massive PTE [18].

In our patient, cardiac arrest occurred because of severe PTE, and we resuscitated the patient, immediately used PCPS, and treated her with thrombolysis for PTE. We then performed total abdominal hysterectomy to remove a large uterine leiomyoma. Such uterine leiomyomata and other pelvic tumors can potentially compress or invade the pelvic vessels, therefore, gynecological patients are at high risk of VTE [19,20]. Therefore, preoperative screening for VTE and use of an inferior vena cava filter should be considered for gynecological patients, and perioperative PCPS should be used in high-risk patients with severe PTE.

Table 1
Comparison of four cases of uterine leiomyoma at our hospital.

	Case 1	Case 2	Case 3	Case 4
Age (y/o)	50	48	50	40
Menopause	No	No	No	No
Gravida-, para-	3, 1	0, 0	2, 2	0, 0
BMI (kg/m ²)	26.1	30.2	26.7	21.5
Weight of resected uterus (g)	1,750	2,900	2,000	2,700
Size of resected uterus (cm)	18 × 18 × 12	21 × 18 × 14	20 × 18 × 11	22 × 11 × 11
Position of thrombosis	Left common iliac vein	Left external iliac vein	Left common iliac vein	ND

Case 4 is the present case; ND: not detected.

References

- [1] Gibbs RS, Karlan BY, Haney AF, Nygaard IE, editors. *Danforth's obstetrics and gynecology*. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2008. p. 916–31.
- [2] Chong YS, Fong YF, Ng SC. Deep vein thrombosis in patients with large uterine myomata. *Obstet Gynecol* 1998;92:707.
- [3] Dekel A, Rabinerson D, Dicker D, Ben-Rafael Z. Thrombosis of the pelvic veins associated with a large myomatous uterus. *Obstet Gynecol* 1998;92:646–7.
- [4] Phupong V, Tresukosol D, Taneepanichskul S, Boonkasemsanti W. Unilateral deep vein thrombosis associated with a large myoma uteri. A case report. *J Reprod Med* 2001;46:618–20.
- [5] Falcone M, Serra P. Massive pulmonary embolism in a woman with leiomyomatous uterus causing pelvic deep venous thrombosis. *Ann Ital Med Int* 2005;20:104–7.
- [6] White RH. The epidemiology of venous thromboembolism. *Circulation* 2003;107(Suppl. 1):I4–8.
- [7] Geerts WH, Pineo GF, Heit JA, Bergqvist D, Lassen MR, Colwell CW, et al. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 2004; 126(3 Suppl.):338S–400S.
- [8] Goldhaber SZ. Pulmonary embolism. *Lancet* 2004;363:1295–305.
- [9] Danish SF, Burnett MG, Stein SC. Prophylaxis for deep venous thrombosis in patients with craniotomies: a review. *Neurosurg Focus* 2004;17:E2.
- [10] Loud PA, Katz DS, Bruce DA, Klippenstein DL, Grossman ZD. Deep venous thrombosis with suspected pulmonary embolism: detection with combined CT venography and pulmonary angiography. *Radiology* 2001; 219:498–502.
- [11] Loud PA, Katz DS, Klippenstein DL, Shah RD, Grossman ZD. Combined CT venography and pulmonary angiography in suspected thromboembolic disease: diagnostic accuracy for deep venous evaluation. *AJR Am J Roentgenol* 2000;174:61–5.
- [12] Lim KE, Hsu WC, Hsu YY, Chu PH, Ng CJ. Deep venous thrombosis: comparison of indirect multidetector CT venography and sonography of lower extremities in 26 patients. *Clin Imaging* 2004;28:439–44.
- [13] Kabrhel C, Varraso R, Goldhaber SZ, Rimm EB, Camargo CA. Prospective study of BMI and the risk of pulmonary embolism in women. *Obesity* 2009;17:2040–6.
- [14] Inoue T, Oka H, Oku H. Percutaneous cardiopulmonary support for the treatment of right ventricular thrombus. *Perfusion* 2002;17:73–5.
- [15] Tayama E, Ouchida M, Teshima H, Takaseya T, Hiratsuka R, Akasu K, et al. Treatment of acute massive/submassive pulmonary embolism. *Circ J* 2002;66:479–83.
- [16] Shinn SH, Lee YT, Sung K, Min S, Kim WS, Park PW, et al. Efficacy of emergent percutaneous cardiopulmonary support in cardiac or respiratory failure: fight or flight? *Interact Cardiovasc Thorac Surg* 2009;9:269–73.
- [17] Vohra HA, Whistance RN, Mattam K, Kaarne M, Haw MP, Barlow CW, et al. Early and late clinical outcomes of pulmonary embolectomy for acute massive pulmonary embolism. *Ann Thorac Surg* 2010;90:1747–52.
- [18] Fukuda I, Taniguchi S, Fukui K, Minakawa M, Daitoku K, Suzuki Y. Improved outcome of surgical pulmonary embolectomy by aggressive intervention for critically ill patients. *Ann Thorac Surg* 2011;91:728–33.
- [19] Santoso JT, Evans L, Lambrecht L, Wan J. Deep venous thrombosis in gynecological oncology: incidence and clinical symptoms study. *Eur J Obstet Gynecol Reprod Biol* 2009;144:173–6.
- [20] Suzuki N, Yoshioka N, Ohara T, Yokomichi N, Nako T, Yahagi N, et al. Risk factors for perioperative venous thromboembolism: a retrospective study in Japanese women with gynecologic diseases. *Thromb J* 2010;8:17.