

## Special Issue - Atherosclerotic Vascular Disease

# When Can a Pulmonary Embolism and Deep Vein Thrombosis Patient Fly Safely Again on Airplane? A Case Report

Lin S-L<sup>1\*</sup>, Lin W-C<sup>1</sup> and Hsu N-W<sup>2</sup><sup>1</sup>Department of Internal Medicine, Division of Cardiology, Kaohsiung Yuan's General Hospital, Kaohsiung City, Taiwan<sup>2</sup>Department of Diagnostic Radiology, Kaohsiung Yuan's General Hospital, Kaohsiung City, Taiwan**\*Corresponding author:** Shoa-Lin Lin, Department of Internal Medicine, Division of Cardiology, Yuan's General Hospital, 162, Cheng-Kung First Road, Lingya District, Kaohsiung 80249, Taiwan**Received:** June 11, 2021; **Accepted:** July 06, 2021;**Published:** July 13, 2021**Abstract**

There was no recommendation in the current guidelines for how long after the pulmonary embolism (PE) attack the patient can fly again safely on an airplane. A 45 years old female was admitted to our hospital because of deep vein thrombosis and acute PE. Due to persistent leg swelling and afraid of recurrent PE for long distance flights, this patient received four weeks anticoagulant therapy before flying. Eventually, she flew back safely. This report describes our preliminary experience for managing this patient with deep vein thrombosis and PE.

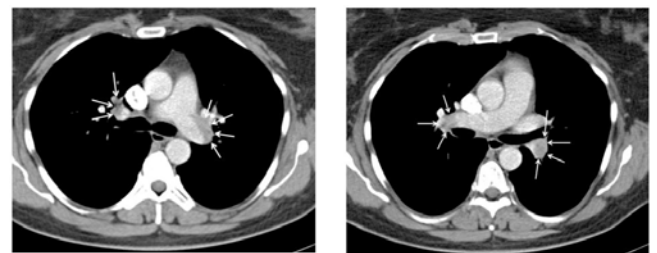
**Keywords:** Acute pulmonary embolism; Anticoagulant; Computed tomography scan; Deep vein thrombosis

**Introduction**

Acute Pulmonary Embolism (PE) is a form of venous thromboembolism that is common and sometimes fatal [1,2]. We had a patient who developed deep vein thromboembolism and acute PE. Since this patient was a foreigner, after the initial treatment, she intended to go back to her country. Thus, the question arose regarding when a patient with acute PE and Deep Vein Thrombosis (DVT) can fly safely after the initial PE attack. Since there was no recommendation in the current European Society of Cardiology (ESC) [3] and American Society of Hematology (ASH) guidelines [4] for how long after PE attack the patient can fly safely, I have searched the query online. Diverse recommendations including waiting to fly on an airplane for at least four weeks [5] or even a few weeks to months after having DVT [6] were proposed. We herein report our preliminary experience with a patient who presented with DVT and acute PE.

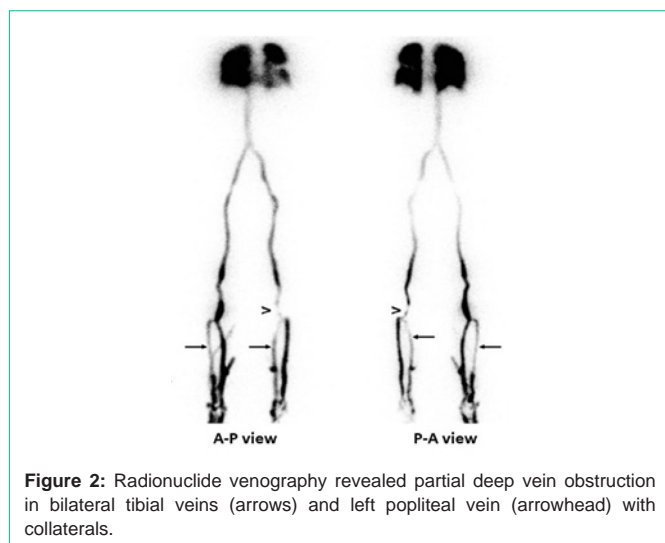
**Case Presentation**

A 45 years-old female had traveled from Amsterdam to Taiwan for a vacation. On the 4<sup>th</sup> day after arrival in Taiwan, she had visited Taroko Mountain. She and her husband had to remain inside the hotel due to persistent raining for three days. Due to bad weather, she was almost entirely inactive in those three days. Afterwards, they travelled by train to Kaohsiung city for further holidays. Unfortunately, she developed leg swelling, chest tightness, tachycardia, and shortness of breath on the 1st day arriving in Kaohsiung city. She was sent to our Emergency Department (ED) for further management on October 16, 2017. At our ER, electrocardiogram showed normal sinus rhythm. Chest film showed borderline cardiomegaly but no active lung disease. Lab. data showed elevation of d-dimer (15.63mg/L). Chest Computed Tomography (CT) scan revealed filling defects in bilateral pulmonary arteries and interlobar pulmonary arteries (Figure 1). Under the impression of pulmonary embolism, she was admitted to our intensive care unit for further management on October 16, 2017.



**Figure 1:** Chest CT scan images showed partial pulmonary thromboembolism with partially filling defects (arrows) in bilateral pulmonary arteries and interlobar pulmonary arteries (Left and Right panels).

After admission, the vital signs were temperature: 37.6°C, heart rate: 102bpm, respiratory rate: 22/min, and blood pressure: 115/70mmHg. Body height: 174cm, body weight: 90Kg. Consciousness was alert. Other physical examinations were non-contributory except mild edema over both lower legs. The oxygenation with nasal cannula 3L/min, intravenous normal saline 1000mL daily and low molecular heparin (Clexane 6000unit scq12h) were administered. We have assessed Protein C, Protein S and Antithrombin III for detection the possibility of inherited cause of pulmonary embolism. The data of these three proteins were within normal limit (Protein-C=96.1%, Protein-S=85.9%, antithrombin III=81.9%). The echocardiogram revealed normal cardiac size and wall motion. The estimated LVEF=72%. The abdominal sonography was performed to study the possibility of malignancy, which did not find any abnormality. On October 18, rivaroxaban 15mg twice daily was prescribed after one dose enoxaparin (clexane) overlapping. Since the tachypnea and tachycardia improved after our treatment, she was transferred to CV ward on October 18. The radionuclide venography revealed partial deep vein obstruction in bilateral tibial veins and left popliteal vein with collaterals, which was consistent with DVT (Figure 2). We considered that the possible causes of DVT and PE may be long distance flying and inadequate exercise. She also informed that she was taking birth control pills, which might be another possible factor



**Figure 2:** Radionuclide venography revealed partial deep vein obstruction in bilateral tibial veins (arrows) and left popliteal vein (arrowhead) with collaterals.

for venous thrombosis. After our treatment, except mild swelling of both lower legs, her general condition improved gradually. She was discharged on October 21, 2017. We recommended her to take rivaroxaban 15mg twice daily for 21 days, and then switch to 20mg daily for 6 months. Two weeks after discharge, she came back to our OPD. She asked whether she could fly back to the Netherlands. At that time, there were no data or recommendations regarding how long after acute PE a patient can safely fly on an airplane, especially for a long-haul flight. Besides, she still had mild legs swelling. Owing to the concerning of recurrent DVT and PE for long distance fly, she received 4 weeks rivaroxaban therapy before flying. Eventually, she flew back safely and received similar treatment for six months. Afterwards, there was no more leg edema and she felt quite well. It had been uneventfully until another PE attack developed in September 2019. After a blood test showed an increased d-dimer score, she was asked to go to the ED of a nearby hospital, where she received a series of examinations including a chest CT scan. After a couple of hours, she was seen by an ED doctor and acute PE was confirmed. Since she had already underwent a detailed studies during last hospitalization at Taiwan, only some necessary examinations were performed. No new cause of PE was established. Afterwards, she cycled home with a prescription of apixaban (Eliquis) 10mg, twice a day for 10 days. Two days after being diagnosed with PE she was allowed to fly to Glasgow, Scotland (60 minutes flight). Ten days later, she came back to the local hospital and received apixaban 5mg twice a day for 3 months. Three-month later, she was seen by a thrombosis nurse and doctor before being referred to her family doctor for annual checkup. The apixaban dosage was changed to 2.5mg twice a day permanently.

## Discussion

This report described a female patient who had DVT and acute PE. Due to persistent minor leg swelling and afraid of recurrent DVT and PE for long distance flight, this patient received 4 weeks oral anticoagulant therapy before flying. Afterwards, she flew safely back to her hometown. The common predisposing factors for venous thromboembolism included fracture of lower limb, hospitalization for heart failure or atrial fibrillation/flutter within previous 3 months, hip or knee replacement, myocardial infarction, previous venous thromboembolism, some forms of hereditary

thrombophilia, spinal cord injury, autoimmune diseases, blood transfusion, has a central venous lines, undergo chemotherapy, respiratory failure, hormone replacement therapy, oral contraceptive therapy, infection (specifically pneumonia, urinary tract infection, or human immunodeficiency virus), inflammatory bowel disease, cancer, paralytic stroke, bed rest >3 days, diabetes mellitus, arterial hypertension, Immobility due to prolonged sitting, increasing age, laparoscopic surgery (e.g. cholecystectomy), obesity, pregnancy, varicose veins, etc. [3]. Since the radionuclide venography of this patient showed partial deep vein obstruction in bilateral tibial veins of both legs, we believe that the long distance fly from the Netherlands to here may have caused immobility due to sitting, which is one of the important factors contributed to the DVT. Besides, the lack mobilization of both legs due to bad weather for three days, may also have been contributing to the venous thrombosis. Furthermore, the hormonal use for contraception might have been another risk factor for the venous thrombosis/PE.

Some forms of hereditary thrombophilia, such as deficiency of antithrombin, protein C, or protein S may also the risk factors of venous thrombosis [7,8]. The hereditary thrombophilia may have a lifetime probability of developing venous thromboembolism, the results of protein C, protein S, and antithrombin III were within normal limit of this case. Thus, these factors were unlikely the cause of her PE.

According to the current ESC guideline, the New Oral Anticoagulants (NOACs) are usually preferred over warfarin [3]. The NOACs currently approved by Taiwan government including rivaroxaban, edoxaban, dabigatran, and apixaban. Since the edoxaban and dabigatran can only be initiated after parenteral anticoagulation for five days, which is considered relatively inconvenient. Apixaban has been approved for treatment of PE in Taiwan was in 2017; we were more familiar with rivaroxaban at the time when facing this patient. Since rivaroxaban and apixaban can be initiated directly without pre-treatment with parenteral anticoagulation, which may be the reason why Netherlands' doctor preferred the administration of apixaban for treating the PE for this case.

In conclusion, since there is no recommendation currently from the European Society of Cardiology and American Society of Hematology guidelines regarding how long after deep vein thrombosis and PE attack can a patient fly again safely on an airplane, when his/her leg swelling had still not subsided, a 4-week anticoagulant therapy might be advisory before considering next flight. However, if there is no leg edema, short distance flight may be acceptable after adequate NOAC therapy for 2 days.

## Acknowledgement

Authors want to give their deep appreciation to Miss Dunja D for providing detailed history of her another PE attack and contribution in revising the English grammar.

## References

1. Coon WW, Willis PW. Deep venous thrombosis and pulmonary embolism: prediction, prevention and treatment. *Am J Cardiol.* 1959; 4: 611-621.
2. Soloff LA, Rodman T. Acute pulmonary embolism. II. Clinical. *Am Heart J.* 1967; 74: 829-847.
3. Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing GJ, Harjola

- VP, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *Eu Heart J.* 2020; 41: 543-603.
4. Ortel TL, Neumann I, Ageno W, Beyth R, Clark NP, Adam Cuker A, et al. American Society of Hematology 2020 guidelines for management of venous thromboembolism: treatment of deep vein thrombosis and pulmonary embolism. *Blood adv.* 2020; 4: 4693-4738.
  5. Everything you need to know about deep vein thrombosis (DVT) and flying. 2021.
  6. Can I fly again after deep vein thrombosis? 2021.
  7. Martinelli I, Mannucci PM, De Stefano V, et al. Different risks of thrombosis in four coagulation defects associated with inherited thrombophilia: a study of 150 families. *Blood.* 1998; 92: 2353-2358.
  8. Lijfering WM, Brouwer JL, Veeger NJ, et al. Selective testing for thrombophilia in patients with first venous thrombosis: results from a retrospective family cohort study on absolute thrombotic risk for currently known thrombophilic defects in 2479 relatives. *Blood.* 2009; 113: 5314-5322.