

## Bilateral Deep Vein Thrombosis in a Cabin Crew Manager: When the Job Increases the Risk

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### Abstract

### Case Report

Deep vein thrombosis (DVT) is a major public health problem due to its frequency and potentially serious complications. In aviation, DVT is a serious vascular condition leading to sudden or subtle incapacitation, such as pulmonary embolism, which can compromise flight safety. This paper study examines the aeromedical considerations of bilateral DVT through the case of a 37-year-old cabin crew member with no medical history. It highlights occupational risks in aviation and the importance of early diagnosis in preventing severe complications. In addition, we will look at the aeromedical regulatory standards and the requirements for aeromedical certification in DVT situations, and analyzing how different aviation authorities assess and manage the fitness of affected aircrew members.

**Keywords:** Aeromedical Fitness, Flight Crew, Flight Safety, Medical Fitness Standards.

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## INTRODUCTION

Deep vein thrombosis (DVT), together with pulmonary embolism (PE), represents one of the two main manifestations of venous thromboembolic disease (VTE). The clinical presentation of DVT is varied, and diagnosis is based on non-invasive methods, such as clinical probability scores, biological marker analysis, and imaging techniques (including Doppler venous ultrasound). The treatment involves the use of anticoagulants at therapeutic doses [1].

In Aeronautics, many factors can influence the physiopathology and cause DVT. An international expert meeting defined "traveller's thrombosis" as venous thromboembolism occurring during or within 4 weeks after a long-haul flight. Long-haul air travel is now recognized as a significant risk factor for DVT and pulmonary embolism (PE) [2].

In Aeronautical Medicine, managing the health of aircrew is crucial to ensuring the safety of both flights and passengers. This case report explores the link between deep vein thrombosis and aeronautical activity, focusing on its pathophysiology and aeromedical decision-making.

## CASE REPORT

A 37- years old male cabin attendant, with a total of 600 flight hours, mainly on long-haul flights, a chronic smoker with no notable medical history, developed a well-limited ecchymotic lesions on both lower limbs, during his two-day stay in Abidjan and after a six-hour working flight. (Figure1)

As soon as he returned, he began to feel heaviness in both lower limbs. He consulted a doctor, who prescribed an ultrasound-doppler scan of the lower limbs and a biological work-up, after a careful clinical examination that revealed a positive Homans' sign, a decrease in the rocking of both calves and inflammatory signs. The Doppler ultrasound revealed bilateral stepped venous thrombosis of the two popliteal veins, with spontaneous contrast upstream and downstream of the thrombosed areas, and 50% reduced compressibility. (Figure2)

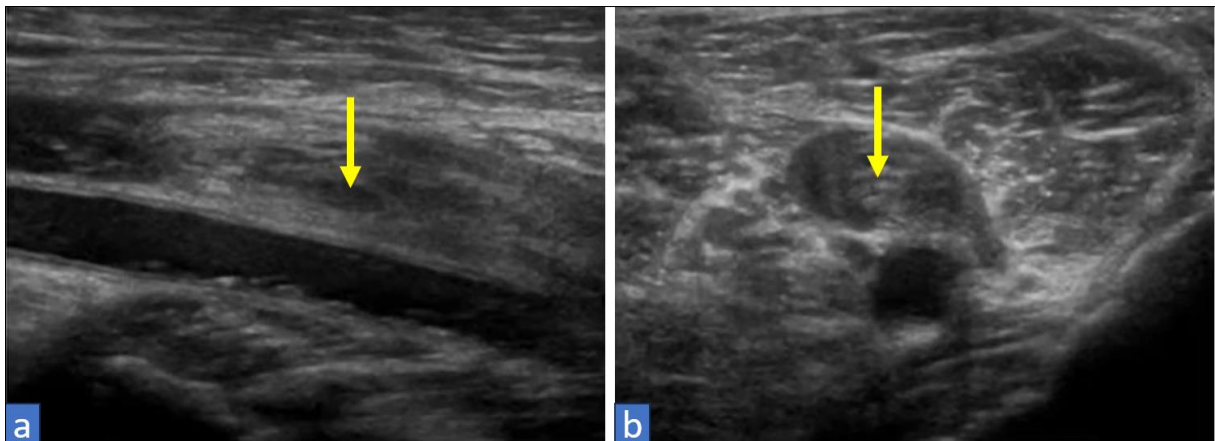
Our cabin attendant was put on oral anticoagulants (Rexaban 30 mg/day) for three months. The etiological investigations for thrombophilia, autoimmune disease or cancer were negative. A thoracic-abdominopelvic CT scan revealed no particular abnormalities other than bilateral dendritic gynecomastia

with no suspicious nodular lesions. Because of anticoagulant medication, the cabin crew member was considered unfit for duty. After completing his therapy

and becoming asymptomatic, he was declared fit by a waiver with a quarterly assessment.



**Figure 1: Clinical image showing ecchymotic lesions on the lower limb**



**Figure 2: Ultrasound of the right (a) and left (b) lower limbs performed with a superficial probe in longitudinal (a) and transverse (b) sections showing a typical aspect of deep vein thrombosis in both popliteal veins**

## DISCUSSION

Deep vein thrombosis (DVT) occurs when a blood clot blocks a leg vein (popliteal, gastrocnemius, etc.), more rarely the pelvic vein. Its primary complication is pulmonary embolism, caused by the clot migrating to the pulmonary artery. Due to the prevalence of asymptomatic cases, the actual incidence of DVT is likely higher than 1 in 1,000 in the general population [3].

We consider Virchow's Triad, endothelial dysfunction, venous blood stasis, and hypercoagulability to be the physiological factors that, when messed up, promote to VTE [4].

The diagnosis of deep vein thrombosis is based on clinical, biological and radiological aspects.

Clinically, DVT can manifest as: localized pain, unilateral leg irritation, inflammation, spontaneous or palpation-triggered pain (in 60% of cases), and non-varicose collateral superficial veins. Bilateral and comparative exams are recommended. Diagnosis relies on calculating clinical probability, with the Wells score being the most commonly used [1].

Biologically, D-dimers (DD) are biological indicators of fibrinolysis that takes place during an episode of venous thrombosis. When it occurs to proximal DVT, their negative predictive value is more than 98% [5].

Radiologically, Doppler ultrasound of the lower limbs is the standard radiological test used to diagnose DVT. Its sensitivity and specificity for proximal deep

vein thromboses are about 100%. In the sural region, it performs worse when identifying distal DVT [5].

Anticoagulants are the primary treatment for DVT, preventing clot formation and embolization. DOACs or warfarin are used for mild to moderate cases, while severe cases may require IVC filters, thrombolysis, or thrombectomy. Supportive measures like mobility and compression stockings are essential to prevent long-term complications. Treatment duration depends on individual risk factors, with lifelong anticoagulation for high-risk patients [1].

The "economy class syndrome," is hard to estimate and likely underreported, as most cases occur during or shortly after travel. Severe cases can lead to sudden pulmonary embolism, making early detection and prevention essential [4]. Frequent long-haul flights, especially over six hours, increase DVT risk, even in low to moderate-risk individuals [6].

The Aeronautical activity is subject to many specific and non-specific restrictions that can promote the risk of DVT and consequently increase the risk of PE. These constraints include:

- **Immobility:** Prolonged sitting in a confined space, like during a flight is believed to reduces venous blood flow in the legs, potentially triggering clot formation. After six hours, coagulation factors rise while thrombin generation and thrombomodulin decrease. Pilots and passengers using sleeping pills or alcohol are particularly affected [7].
- **Hypoxia:** Several studies have investigated whether moderate hypoxia during long-haul flights increases the risk of thrombosis by shifting the balance between coagulation and fibrinolysis. Conditions on the ground are not the same as those in the cabin [8].
- **Dehydration:** Temperature fluctuations may be caused by the unit's air conditioning system. But low cabin humidity (10–20%) is the main concern, causing mucous membrane dryness and dehydration [9].
- **Individual Factors:** Advanced age, obesity, history of DVT, pregnancy, use of hormonal contraceptives, cancer, chronic inflammatory diseases, and cardiovascular conditions. Although smoking is now prohibited during flights, it still contributes to increased blood viscosity and higher fibrinogen levels [10].

Special measures are needed to reduce the risk of VTE during air travel, especially for high-risk patients. Preventive approaches include medications like aspirin or anticoagulants and non-pharmacological methods such as compression stockings and adequate hydration [11].

For the aeromedical fitness management, the flight crew must meet medical fitness standards to ensure safety and mission success. Each crew member must be physically and mentally fit to perform their duties effectively.

The International Civil Aviation Organization (ICAO) Manual on aeronautical fitness, provides guidelines on the medical requirements for aircrew to ensure flight safety. It states that applicants must be free from any medical condition, disability, or medication that could affect their health, performance, or safety [12].

In Morocco, aeronautical fitness standards are regulated by Ministerial Decree N° 1209-09, aligning with the standards established by ICAO. The Moroccan manual states that arterial diseases, varicose veins with complications, or any cardiovascular anomaly affecting normal function result in unfitness [13].

In aeronautics, DVT poses a serious risk to flight safety, potentially causing sudden incapacitation or gradual impairment. Symptoms like shortness of breath, chest pain, haemoptysis, leg pain, and dizziness can distract crew members, compromising their ability to perform duties safely [14].

Therefore, for medical aptitude management, any DVT at admission results in unfitness. Aircrew with a history of DVT may be deemed fit if they follow preventive treatment and pose no risk of complications. Recent DVT cases or those on anticoagulants are temporarily unfit for 3 to 6 months due to bleeding risks [13]. After a sufficient observation period, quarterly conditional fitness may be granted with regular follow-ups. Preventive measures are essential to prevent recurrence, which could lead to permanent disqualification.

In our case, our cabin crew member received quarterly conditional fitness approval with cardiovascular monitoring and Doppler ultrasound every six months for two years. While no specific cause for DVT was identified, factors like smoking, hypoxia, Travel to the tropical areas, dehydration, and long-haul flights may have contributed. Recommended preventive measures include avoiding long-haul flights, wearing compression stockings, quitting smoking, staying hydrated, and limiting alcohol and caffeine. Currently, the cabin crew member is progressing well after stopping treatment while maintaining these preventive measures.

## CONCLUSION

Prolonged immobility, reduced cabin pressure, dehydration, and other factors are major risk contributors to the development of deep vein thrombosis (DVT), mainly in predisposed individuals. A proactive management is crucial to ensure aviation safety and

prevent serious complications, such as pulmonary embolism, which could jeopardize flight safety.

**Conflict of Interest statement:**

The authors declare that there is no conflict of interest. All authors confirm that they have obtained written consent from the patient for publication of the article.

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