

Economy Class Syndrome or Immobile Traveler's Syndrome?

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Economy class syndrome describes the situation of patients who suffer pulmonary embolism following prolonged immobility in a long distance flight. The objective of the present study was to analyze whether there is a risk of pulmonary thromboembolism after a long overland journey.

The study consecutively enrolled 100 patients diagnosed with pulmonary thromboembolism. Nine of them had previously undertaken a long journey (>5 h), 6 of which had been over land. Consequently, we think that the preventative measures recommended for airline passengers should be extended to users of other means of transport.

Key words: *Deep vein thrombosis. Pulmonary thromboembolism. Traveler's syndrome. Economy class syndrome.*

¿Síndrome de la clase turista o síndrome del viajero inmovilizado?

El síndrome de la clase turista es el que se asocia a personas que presentan una embolia pulmonar a consecuencia de una inmovilización prolongada tras un viaje por vía aérea de larga duración. El objetivo del presente trabajo ha sido analizar si existe riesgo de tromboembolia pulmonar tras un viaje de larga duración por vía terrestre.

Se ha estudiado a 100 pacientes consecutivos diagnosticados de tromboembolia pulmonar. De ellos, 9 presentaban el antecedente de haber realizado un viaje prolongado (> 5 h) y en 6 de estos casos el transporte fue terrestre. Por este motivo pensamos que las medidas preventivas propuestas para los viajeros por vía aérea deben extenderse a quienes utilizan otro medio de transporte.

Palabras clave: *Trombosis venosa profunda. Tromboembolia pulmonar. Síndrome del viajero. Síndrome de la clase turista.*

Introduction

The first reference to the association between immobility and the risk of deep vein thrombosis (DVT) dates from 1940 when cases of pulmonary embolism were reported in persons who had spent long periods of almost total immobility in subterranean air raid shelters during the bombing raids on London during the Second World War.¹ The association between travel and DVT was first reported in 1954 with a description of 5 cases,² and soon the phrase "economy-class syndrome"^{3,4} appeared to describe the problems of venous return that occur in passengers on long distance flights in seats with evident restrictions of space and few opportunities to move their lower limbs. Since then, there have been several published case series involving patients who have taken long-distance flights and later developed DVT and/or pulmonary thromboembolism,⁵⁻⁷ but few

authors have associated those 2 conditions with overland travel by car, coach, lorry, or train.^{8,9} We present 9 cases of pulmonary embolism secondary to venous stasis caused by prolonged sitting with little movement during a long journey on one of several means of transport.

Description of Cases

We performed a prospective study of patients with pulmonary embolism secondary to venous stasis during a long journey. Over a period of 2 years, 100 consecutive patients who had been admitted to the pneumology department of the hospital for pulmonary embolism were interviewed in detail about risk factors and journeys undertaken in the days prior to diagnosis. Of the 100 patients, 9 reported having undertaken a prolonged journey with scarce mobility within the previous month. Such a journey was defined as lasting longer than 5 hours in conditions in which the patients' legs were immobile or had little movement.

A patient's clinical history was examined as well as results of the physical examination, chest x-ray, electrocardiogram, ventilation/perfusion scintigraphy and/or computed tomography/angiography, lower limb Doppler ultrasound and contrast venography in cases of doubt or risk of recurrence. Coagulation (prothrombin time and partial thromboplastin time) factors and concentrations of S and C proteins, antithrombin III, lupus anticoagulant, and D-dimer were

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TABLE
Characteristics of Patients Who Had Undertaken a Long Journey Prior to Presenting Pulmonary Embolism*

Patient	Sex	Age, and	Length of Journey, h	Latency Time, h	Means of Transport	Risk Factors	PE Extension	D-Dimer, ng/mL	
								Initial	6 Months
1	W	77	14	240	Airplane	Age	Extensive, bilateral	>1000	123
2	W	71	9	120	Coach	Age, hip osteoarthritis	Extensive, bilateral	>1000	250
3	W	26	8	72	Car	Oral contraceptives	Extensive, unilateral	>1000	180
4	W	70	5	72	Car	Previous PE	Extensive, unilateral	>1000	153
5	W	78	10	48	Coach	Age	Extensive, bilateral	>1000	350
6	W	89	7	48	Coach	Age, heart failure	Extensive, bilateral	580	–
7	W	65	9	12	Airplane	Chronic venous insufficiency, DVT	Extensive, bilateral	682	200
8	W	58	5	240	Airplane	Hormone treatment	Extensive, bilateral	580	–
9	W	77	13	24	Coach	Age, DVT	Extensive, bilateral	>1000	200

*PE indicates pulmonary embolism; M, man; W, woman; DVT, deep vein thrombosis.

analyzed in blood. For D-dimer level we used a modified enzyme-immunoassay (Dade Behring, Newark, Delaware, USA); values less than 552 ng/mL were considered within the normal range.

Ventilation—perfusion scintigraphy was performed on all patients 1, 3, and 6 months after admission until results were normal or anticoagulant treatment had terminated.

Statistical Analysis

Descriptive statistics (percentages, means, and ranges) were compiled for the episodes.

Results

During the 2 years analyzed, 100 patients with pulmonary embolism were admitted to the respiratory medicine ward. Nine (9%) had undertaken a prolonged journey prior to admission. Patient and journey characteristics are presented in the Table. Seven patients were women. Mean age was 67.8 years (range, 26–89). Pulmonary embolism was suspected on first diagnosis in all 9 patients.

Six patients used overland transport (2 traveled by car and 4 by coach) and 3, air transport. The mean age of the 6 overland travelers was 68.5 years. The mean length of time spent in the vehicle was 8.8 hours (range, 5–14). The mean length of time between the end of the journey and onset of clinical symptoms was 97.3 hours (range, 12–240). Ventilation/perfusion scintigraphy and/or computed tomography angiography confirmed the clinical diagnosis in all patients. Pulmonary embolism was extensive and bilateral in 7 patients and unilateral in 2. DVT was observed by Doppler ultrasound or contrast venography in only 5 patients. As additional risk factors, 6 patients were aged 70 years or older, 2 reported previous DVT and 1 a previous pulmonary embolism, 1 patient presented hip osteoarthritis, and 1, heart failure. One patient was taking oral contraceptives and 1, hormone replacement therapy for menopause. In our study no patient presented thrombophilia. In all cases, the D-dimer dosage administered in the emergency department was greater than 552 ng/mL.

Ventilation—perfusion scans were normal at 1 month for 3 patients and at 6 months for the other 6. D-dimer

levels were normal at 6 months in the 7 patients for whom that parameter was analyzed.

Discussion

Stasis caused by sitting and immobility during prolonged journeys (>5 hours) is considered a risk factor for pulmonary embolism. “Economy-class syndrome” is the name given to pulmonary embolism related to long-distance flights.^{3,4} The mechanism that increases risk would appear to be blood stasis caused by immobility in a sitting position,¹⁰ associated with effects such as fluid retention in the legs,¹¹ reduction of oxygen in the cabin,¹² hemoconcentration secondary to dehydration,¹³ and activation of coagulation.¹⁴ However, this syndrome has also been described in first- or business-class passengers and even, as in the study presented here, in prolonged overland journeys.^{8,9} For this reason the syndrome is being renamed travelers’ syndrome.¹⁵

Over 200 cases of pulmonary embolism associated with travel have been reported in the last 20 years.^{3,9,16–18} The results of these studies have led to the debate over the association between traveling and the condition and epidemiological studies do not manage to find a clear indication that long journeys are a major risk factor. Nevertheless, in March 2001 the World Health Organization accepted that there was a probable risk of presenting pulmonary embolism after prolonged flights despite the low incidence and the presence of other risk factors in most of the passengers affected.

Several studies have tried to use theoretical explanations to defend the hypothesis that long-distance journeys increase the risk. However, the real risk has been poorly quantified, given the diverse diagnoses and particularly the absence of a demonstrated cause-effect relationship. The case-control studies available report contradictory results. Ferran et al⁹ and Kesteven¹⁶ found that traveling was a risk factor for DVT and pulmonary embolism, Kraaijenhagen et al¹⁷ and Ten Wolde et al¹⁸ found no association.

Neither has it been established whether risk is associated with air travel alone or, as seen in our study, with several means of transport. For example, some authors find no differences between the risk associated

with different types of vehicles—airplane, coach, train, or car⁹—while others only identify the risk associated with air transport.¹⁸

We do not have, then, any conclusive study on this syndrome and there is epidemiological uncertainty over its existence. Prolonged sitting during travel probably induces venous stasis, evidence of which would be the presence of lower extremity edema.

Should primary prevention be recommended to overland travelers as well as airline passengers? Given the uncertainty it seems reasonable to recommend some safe, simple measures based on common-sense and aimed at preventing venous stasis in travelers on journeys more than 5 hours long. These recommendations should include avoiding sitting with crossed legs, standing up and walking for 2 minutes every 2 hours, and performing flexion and extension exercises with the feet while seated. Appropriate hydration, avoidance of excessive alcohol intake, and wearing loose clothes that do not constrict the waist or legs are also recommended. Passengers with known risk, such as a history of DVT or pulmonary embolism, chronic venous insufficiency, recent surgery, chronic heart or respiratory disease, cancer, and thrombophilia, as well as persons who are elderly, pregnant, overweight, or taking oral contraceptive drugs should take particular care on journeys of more than 5 hours. The use of elastic support tights and prophylaxis with low-molecular-weight heparin have also been recommended.^{8,15,16}

We would like to emphasize that elderly people in Spain frequently undertake long journeys by coach or car where mobility is restricted so the risk of DVT and pulmonary embolism probably increases some hours or days after the journey. The preventative measures given to passengers of intercontinental flights, then, should be extended to these travelers using overland transport.

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