
Foto Flapo, 2002

## Déclaration de relation avec les industries de santé en rapport avec le thème de la présentation (loi du 04/03/2002)

### Conférencier

Air Liquide Santé ; Astra-Zeneca ; Bayer ; Boehringer-Ingelheim ; Lilly ; Daiichy-Sankyo ; Merck-Serono ; The Medicine Company

### Investigateur principal d'une recherche ou d'une étude clinique

Air Liquide Santé ; Astra-Zeneca ; Boehringer-Ingelheim ; Lilly ; Daiichy-Sankyo ; Merck-Serono ; The Medicine Company


Frédéric Lapostolle

SAMU 93, UF Recherche-Enseignement-Qualité

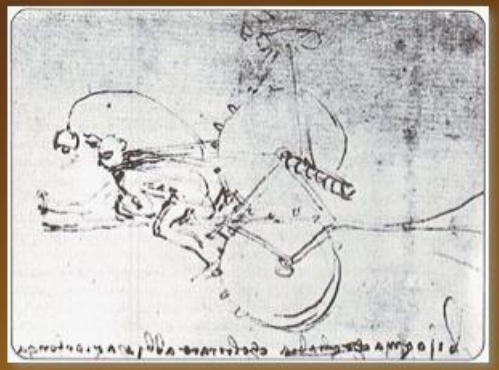
Hôpital Avicenne & Université Paris 13, Bobigny

# Risque thrombo-embolique & voyages aériens


Frédéric Lapostolle

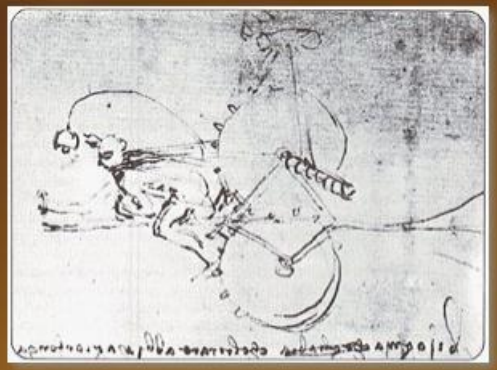
SAMU 93, UF Recherche-Enseignement-Qualité

Hôpital Avicenne & Université Paris 13, Bobigny



Photos : www.acam.asso.fr

# XVème siècle. Prototypes de Leonard de Vinci



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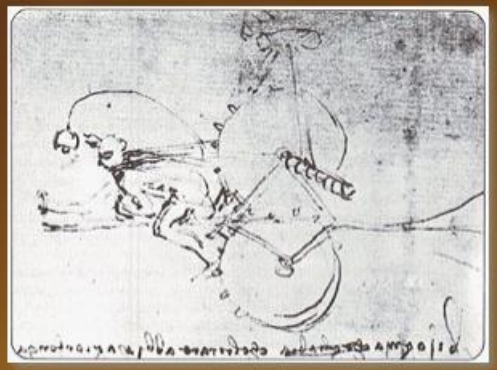

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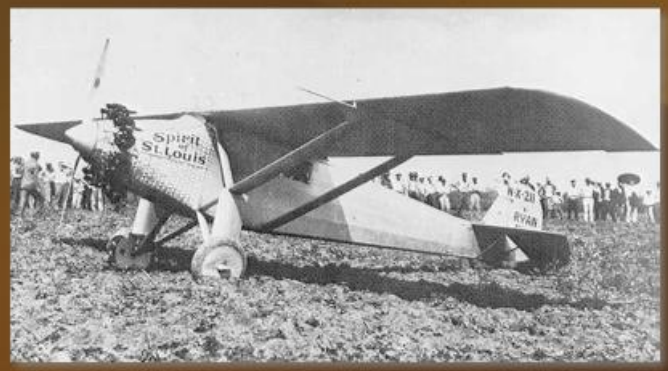

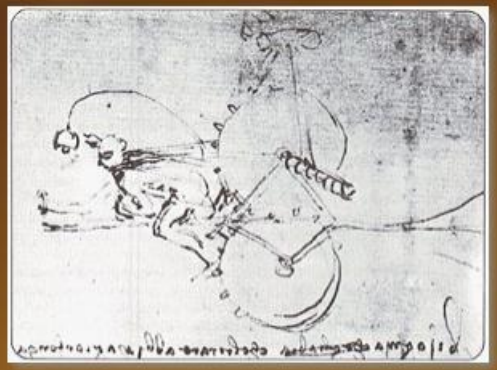

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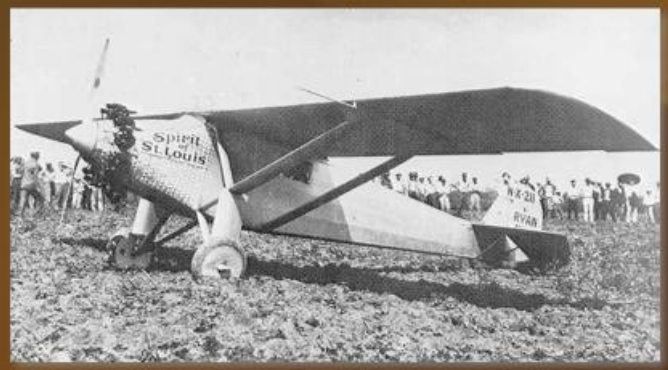


## Années 1920.

## Premières compagnies aériennes commerciales

1951. Avion capable de transporter à vitesse de croisière moyenne de 650 km/h, 80 passagers sur une distance de 2.000 km…


La Caravelle

1951. Avion capable de transporter à vitesse de croisière moyenne de 650 km/h, 80 passagers sur une distance de 2.000 km…

La Caravelle



2008. Airbus A380…

Capable de transporter plus de 500 passagers sur plus de 12.000 km…

# Plus de vols, plus de destinations,

# plus de passagers par vol, sur des vols plus longs

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Un camion rempli de verre se renverse !

Surpris par le blizzard

Accueil > Belgique > Société

## Secteur aérien: l'IATA table sur des bénéfices record en 2010

Belga | 14 Décembre 2010 10h59

Imprimer | Réagir (0)

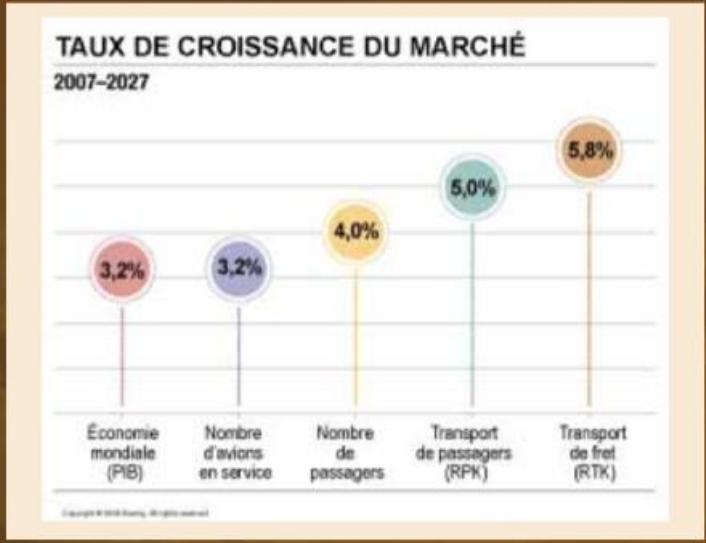
L'Association internationale du transport aérien (IATA) prévoit des bénéfices records pour le secteur en 2010 à 15,1 milliards de dollars contre une estimation de 8,9 milliards en septembre grâce à une meilleure conjoncture économique, a-t-elle indiqué mardi.

"Nous relevons nos prévisions de bénéfices pour l'industrie aérienne en raison d'un solide redressement des recettes et une utilisation nettement meilleure des capacités des avions", a expliqué l'IATA lors de la journée des médias au siège de l'organisation à Genève. "Il s'agit d'un record en dollars", a souligné l'économiste en chef de l'association qui représente près de 230 compagnies aériennes assurant 93% du trafic commercial, Brian Pearce. En revanche, les compagnies aériennes devraient voir leur bénéfices retomber en 2011 à 9,1 milliards de dollars, en raison des prix élevés du pétrole et d'une faible reprise de l'économie européenne, selon l'IATA. "Nous prévoyons toujours une baisse des profits nets en 2011 à 9,1 milliards", a expliqué l'association. (FEJ)

Société

- Grève à la prison de Saint-Gilles: réunion entre la direction et les syndicats mercredi
- Les jeunes Belges réclament des mesures pour leur mobilité
- Des banques aident des clients à se fabriquer une fausse identité
- Secteur aérien: l'IATA table sur des bénéfices record en 2010
- La Flandre choisit son mot de l'année

T-shirts | Gants | Sacs | Casques




14/12 | 07:00 | **Bruno Trevidic**

Les Echos

## Boeing et Airbus bouclent une année record

**Les deux avionneurs, qui enchaînent les commandes record, n'ont jamais livré autant d'avions qu'en 2011 et devraient encore augmenter leur production l'an prochain. Après avoir embauché plus de 4.000 personnes cette année, Airbus prévoit d'en recruter au moins autant en 2012.**

# Carte du monde des vols d'avions en temps réel


Septembre 1913. Tours.
Atterrissage ''involontaire'' d'un Blériot XI militaire


1919. Philadelphia.

1921 : 1.764 atterrissages forcés
(50% causes mécaniques & 50% météorologiques)
12 pilotes tués

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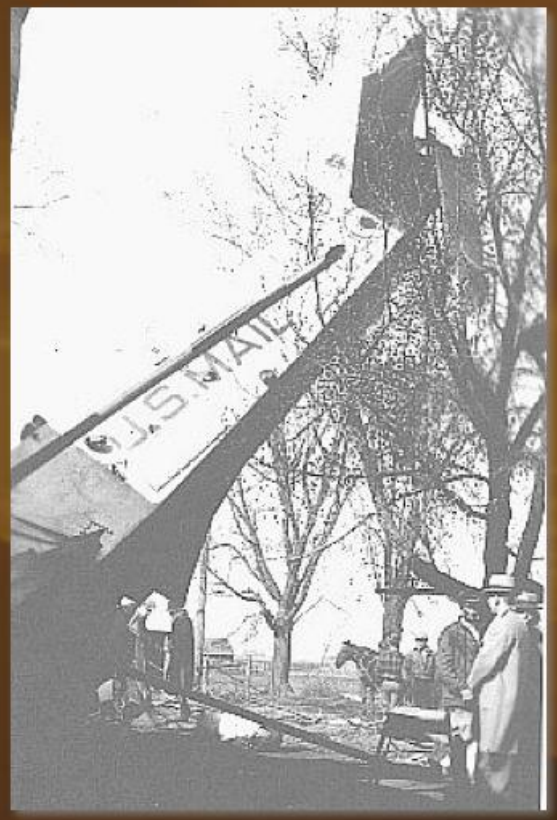



1919. Philadelphia.

1921 : 1.764 atterrissages forcés
(50% causes mécaniques & 50% météorologiques)
12 pilotes tués

D'emblée,
le risque du transport aérien n'a échappé à personne !

france info

Chroniques du ciel

# Les questions autour de la mystérieuse disparition du vol MH-370

LE DIMANCHE 16 MARS 2014 À 07:45 10 commentaires ★★★★☆ (4 votes)

11 Septembre 2001

New-York. 2000 morts

20 Janvier 1992

Mont Saint Odile. 87 morts

25 juillet 2000

Gonesse. 113 morts

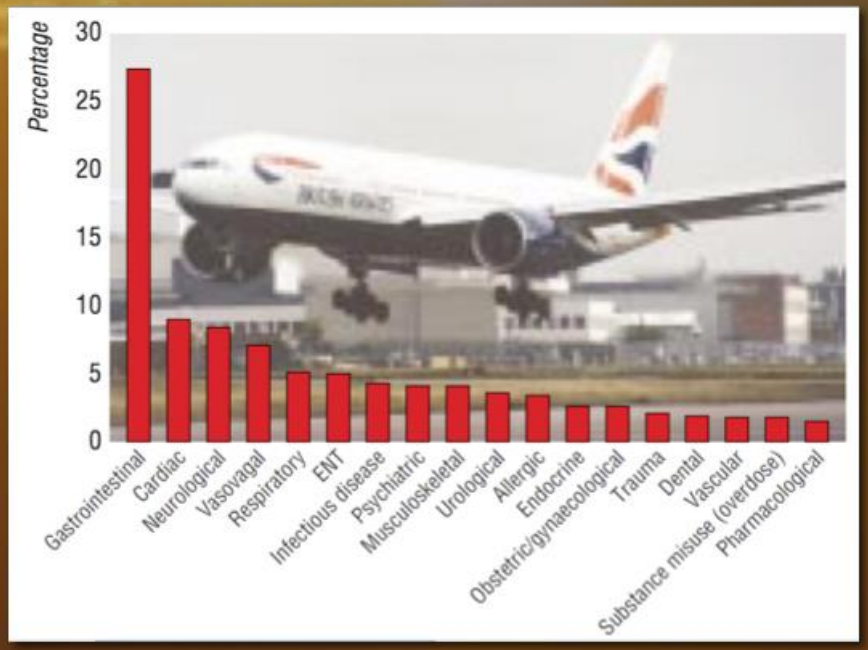
# Conséquences médicales

- In-flights emergencies

Goodwin, *BMJ*, 2000

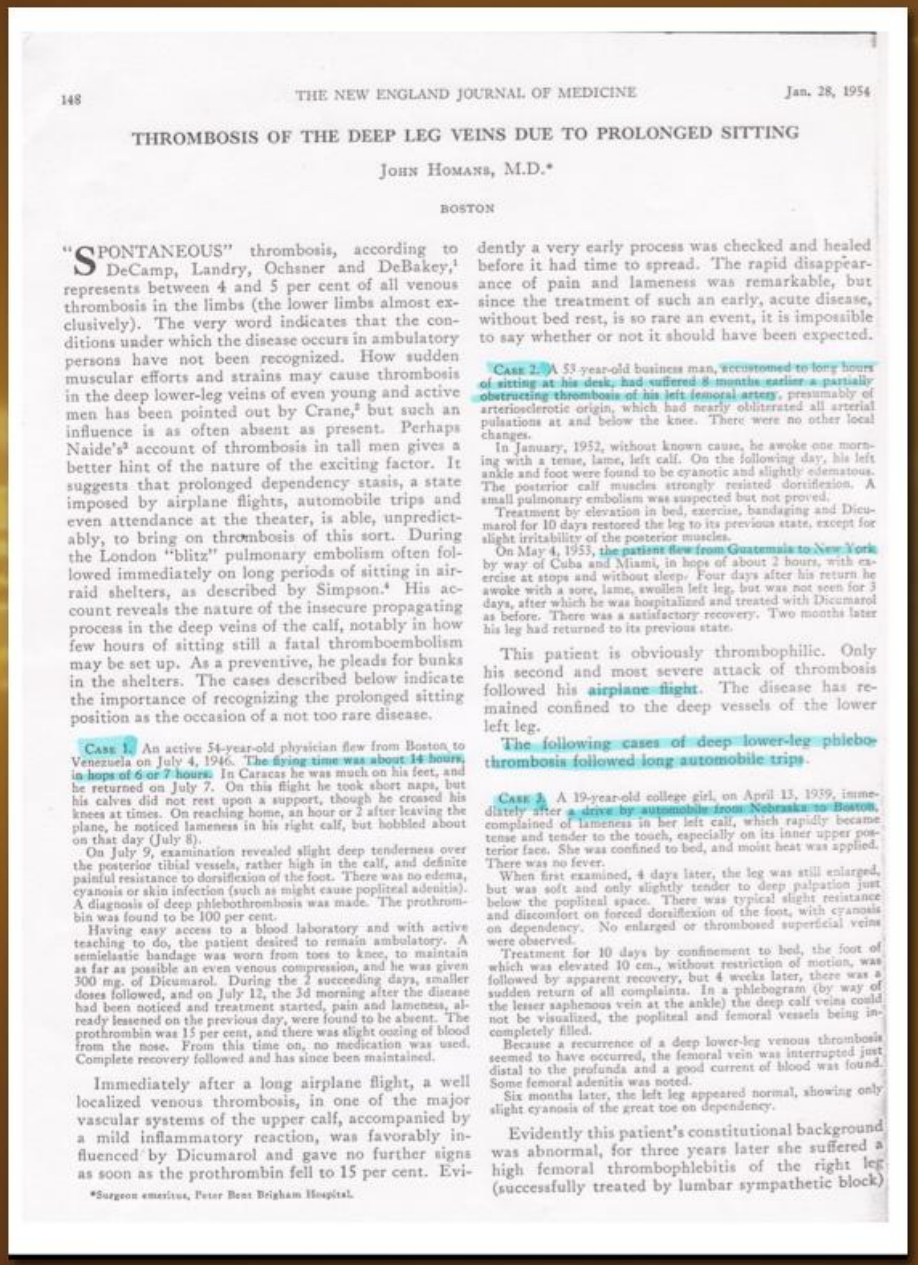
- Responding to medical events during commercial airline flight

Gendreau, *NEJM*, 2002




Is there a doctor in the aircraft ?
Top-10 in flight medical emergencies

Dawdall, *BMJ*, 2000



148 THE NEW ENGLAND JOURNAL OF MEDICINE Jan. 28, 1954

# THROMBOSIS OF THE DEEP LEG VEINS DUE TO PROLONGED SITTING

JOHN HOMANS, M.D.*

BOSTON

"SPONTANEOUS" thrombosis, according to DeCamp, Landry, Ochsner and DeBakey,[1] represents between 4 and 5 per cent of all venous thrombosis in the limbs (the lower limbs almost exclusively). The very word indicates that the conditions under which the disease occurs in ambulatory persons have not been recognized. How sudden muscular efforts and strains may cause thrombosis in the deep lower-leg veins of even young and active men has been pointed out by Crane,[2] but such an influence is as often absent as present. Perhaps Naide's[3] account of thrombosis in tall men gives a better hint of the nature of the exciting factor. It suggests that prolonged dependency stasis, a state imposed by airplane flights, automobile trips and even attendance at the theater, is able, unpredictably, to bring on thrombosis of this sort. During the London "blitz" pulmonary embolism often followed immediately on long periods of sitting in air-raid shelters, as described by Simpson.[4] His account reveals the nature of the insecure propagating process in the deep veins of the calf, notably in how few hours of sitting still a fatal thromboembolism may be set up. As a preventive, he pleads for bunks in the shelters. The cases described below indicate the importance of recognizing the prolonged sitting position as the occasion of a not too rare disease.

CASE 1. An active 54-year-old physician flew from Boston to Venezuela on July 4, 1946. The flying time was about 14 hours, in hops of 6 or 7 hours. In Caracas he was much on his feet, and he returned on July 7. On this flight he took short naps, but his calves did not rest upon a support, though he crossed his knees at times. On reaching home, an hour or 2 after leaving the plane, he noticed lameness in his right calf, but hobbled about on that day (July 8).

On July 9, examination revealed slight deep tenderness over the posterior tibial vessels, rather high in the calf, and definite painful resistance to dorsiflexion of the foot. There was no edema, cyanosis or skin infection (such as might cause popliteal adenitis). A diagnosis of deep phlebothrombosis was made. The prothrombin was found to be 100 per cent.

Having easy access to a blood laboratory and with active teaching to do, the patient desired to remain ambulatory. A semielastic bandage was worn from toes to knee, to maintain as far as possible an even venous compression, and he was given 300 mg. of Dicumarol. During the 2 succeeding days, smaller doses followed, and on July 12, the 3d morning after the disease had been noticed and treatment started, pain and lameness, already lessened on the previous day, were found to be absent. The prothrombin was 15 per cent, and there was slight oozing of blood from the nose. From this time on, no medication was used. Complete recovery followed and has since been maintained.

Immediately after a long airplane flight, a well localized venous thrombosis, in one of the major vascular systems of the upper calf, accompanied by a mild inflammatory reaction, was favorably influenced by Dicumarol and gave no further signs as soon as the prothrombin fell to 15 per cent. Evidently a very early process was checked and healed before it had time to spread. The rapid disappearance of pain and lameness was remarkable, but since the treatment of such an early, acute disease, without bed rest, is so rare an event, it is impossible to say whether or not it should have been expected.

CASE 2. A 53-year-old business man, accustomed to long hours of sitting at his desk, had suffered 8 months earlier a partially obstructing thrombosis of his left femoral artery, presumably of arteriosclerotic origin, which had nearly obliterated all arterial pulsations at and below the knee. There were no other local changes.

In January, 1952, without known cause, he awoke one morning with a tense, lame, left calf. On the following day, his left ankle and foot were found to be cyanotic and slightly edematous. The posterior calf muscles strongly resisted dorsiflexion. A small pulmonary embolism was suspected but not proved.

Treatment by elevation in bed, exercise, bandaging and Dicumarol for 10 days restored the leg to its previous state, except for slight irritability of the posterior muscles.

On May 4, 1953, the patient flew from Guatemala to New York by way of Cuba and Miami, in hops of about 2 hours, with exercise at stops and without sleep. Four days after his return he awoke with a sore, lame, swollen left leg, but was not seen for 3 days, after which he was hospitalized and treated with Dicumarol as before. There was a satisfactory recovery. Two months later his leg had returned to its previous state.

This patient is obviously thrombophilic. Only his second and most severe attack of thrombosis followed his airplane flight. The disease has remained confined to the deep vessels of the lower left leg.

The following cases of deep lower-leg phlebothrombosis followed long automobile trips.

CASE 3. A 19-year-old college girl, on April 13, 1939, immediately after a drive by automobile from Nebraska to Boston, complained of lameness in her left calf, which rapidly became tense and tender to the touch, especially on its inner upper posterior face. She was confined to bed, and moist heat was applied. There was no fever.

When first examined, 4 days later, the leg was still enlarged, but was soft and only slightly tender to deep palpation just below the popliteal space. There was typical slight resistance and discomfort on forced dorsiflexion of the foot, with cyanosis on dependency. No enlarged or thrombosed superficial veins were observed.

Treatment for 10 days by confinement to bed, the foot of which was elevated 10 cm., without restriction of motion, was followed by apparent recovery, but 4 weeks later, there was a sudden return of all complaints. In a phlebogram (by way of the lesser saphenous vein at the ankle) the deep calf veins could not be visualized, the popliteal and femoral vessels being incompletely filled.

Because a recurrence of a deep lower-leg venous thrombosis seemed to have occurred, the femoral vein was interrupted just distal to the profunda and a good current of blood was found. Some femoral adenitis was noted.

Six months later, the left leg appeared normal, showing only slight cyanosis of the great toe on dependency.

Evidently this patient's constitutional background was abnormal, for three years later she suffered a high femoral thrombophlebitis of the right leg (successfully treated by lumbar sympathetic block)

*Surgeon emeritus, Peter Bent Brigham Hospital.

Homans, *NEJM*, 1954

Cas 1 : homme de 54 ans. Thrombose veineuse profonde après 2 x 7 heures de vol en 3 jours.

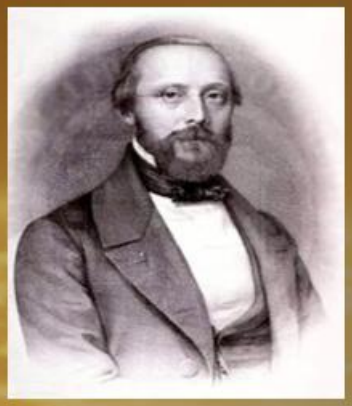
Cas 2 : homme de 53 ans. Thrombose veineuse profonde après 2 x 2 heures de vol en 5 jours.

Cas 3 : femme de 19 ans. Thrombose veineuse profonde après un voyage en voiture Nebraska-Boston.

Cas 4 : homme de 56 ans. Embolie pulmonaire après un voyage en voiture.

Cas 5 : homme de 59 ans. Thrombose veineuse profonde après soirée au théâtre.

# Arguments physiopathologiques



Lésion endothéliale

Triade de Virshow

Virshow,
*Frankfurt Meidinger*, 1856

Stase veineuse

Thrombophilie

# Arguments physiopathologiques

## Lésion endothéliale

- Favorisée position assise, jambes croisées
- Système anti-thrombine endothélial activé

Kieffer, *Med Aéronaut Spatiale*, 1994

Gobin, *Artères Veines*, 1994

Triade de Virshow

Virshow, *Frankfurt Meidinger*, 1856

## Stase veineuse

- Disparition jeu valvulaire
- Perte activité musculaire

Noddeland, *Eur J Appli Physiol*, 1988

Landgraf, *Aviat Space Environ Med*, 1994

## Thrombophilie

Position assise > 1 h

- Hématocrite +30% (42 à 54%)
- Protidémie +40% (6,6 à 9,3 g/dl)

Moyses, *Int J Microcirc Clin Exp*, 1987

# Too much flying or too much sitting?

Dale, *Arch Intern Med*, 2003

## Voiture & théatre !!!

Homans, *NEJM*, 1954

## Train

Lapostolle, *Press Med*, 2004

*CASE STUDY*

**eThrombosis: the 21st Century variant of venous thromboembolism associated with immobility**

Beasley, *Eur Respir J*, 2003


30 July 2011 Last updated at 15:44 GMT

5,189 Share

**Gamer Chris Staniforth's death blamed on DVT**

**A man whose son died after playing video games for long periods is campaigning for greater awareness of the risk posed by their excessive use.**

Chris Staniforth, 20, who would play his console for up to 12 hours, died in May from deep vein thrombosis (DVT).

His father David believes the condition may have been triggered by long gaming sessions.

Chris Staniforth would spend up to 12 hours playing on the console.

DVT can form during long periods of immobility and can kill if the clots travel to the lungs.

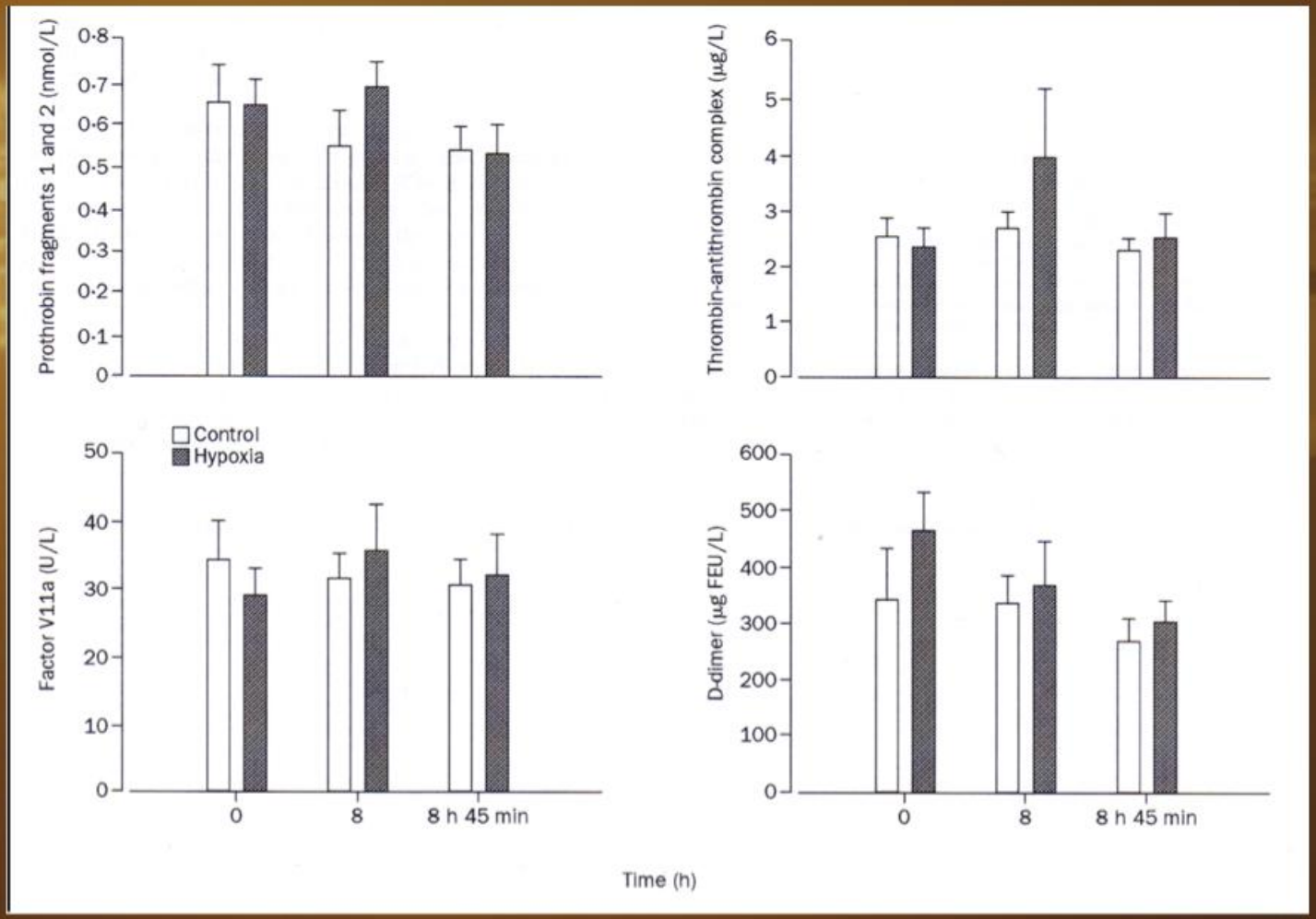
Computer records showed his son would sometimes play online on his Xbox for periods up to 12 hours.

The coroner said a clot formed in Chris' left calf before moving to his lungs.

Related Stories

Dad speaks after son's DVT death

# Rôle propre du voyage aérien : hypoxie/hypobarie




Bendz, *Lancet*, 2003
Crosby, *Lancet*, 2000

- Beighton, *Br Heart J*, 1967

Description de la première embolie pulmonaire

- Symington, *Br J Dis Chest*, 1977

Embolies pulmonaires chez 8 patients après voyages en avion dans une série de 182 patients

« Syndrome de la classe économique »

- Clerel, *Bull Natl Acad Med*, 1999

70 embolies pulmonaires à ADP dont 76% pour vol > 12 h

Incidence estimée à 0,5 cas/million passagers

- Etude échographique après voyage aérien > 8 h

| Scurr, *Lancet*, 2001 | Sans contention | Avec contention |
|---|---|---|
| N=231 | 116 | 115 |
| Anomalies US | 12* (10%) | 0 (0%) |

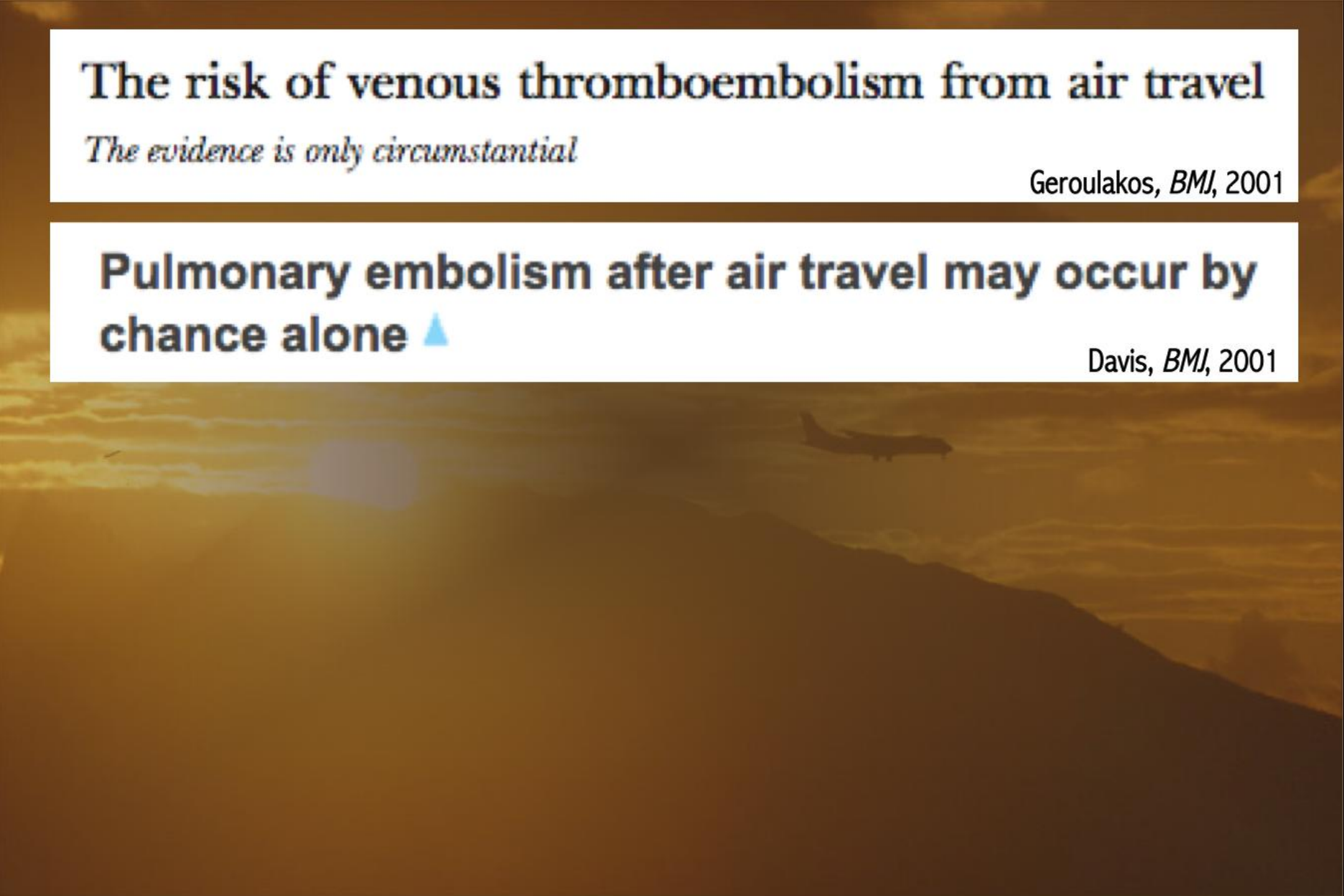
- Etudes cas-témoin

- Voyage > 4 h et < 4 semaines : OR : 3,98 [1,9-8,4] - N=160 :
  Dont 9 voyages en avion, 28 en voiture et train

Ferrari, *Chest*, 1999

- Voyage > 3 h et < 4 semaines : 7% vs 5% : NS – N=788

Kraaijenkagen, *Lancet*, 2000



# The risk of venous thromboembolism from air travel

*The evidence is only circumstantial*

Geroulakos, *BMJ*, 2001

# Pulmonary embolism after air travel may occur by chance alone

Davis, *BMJ*, 2001

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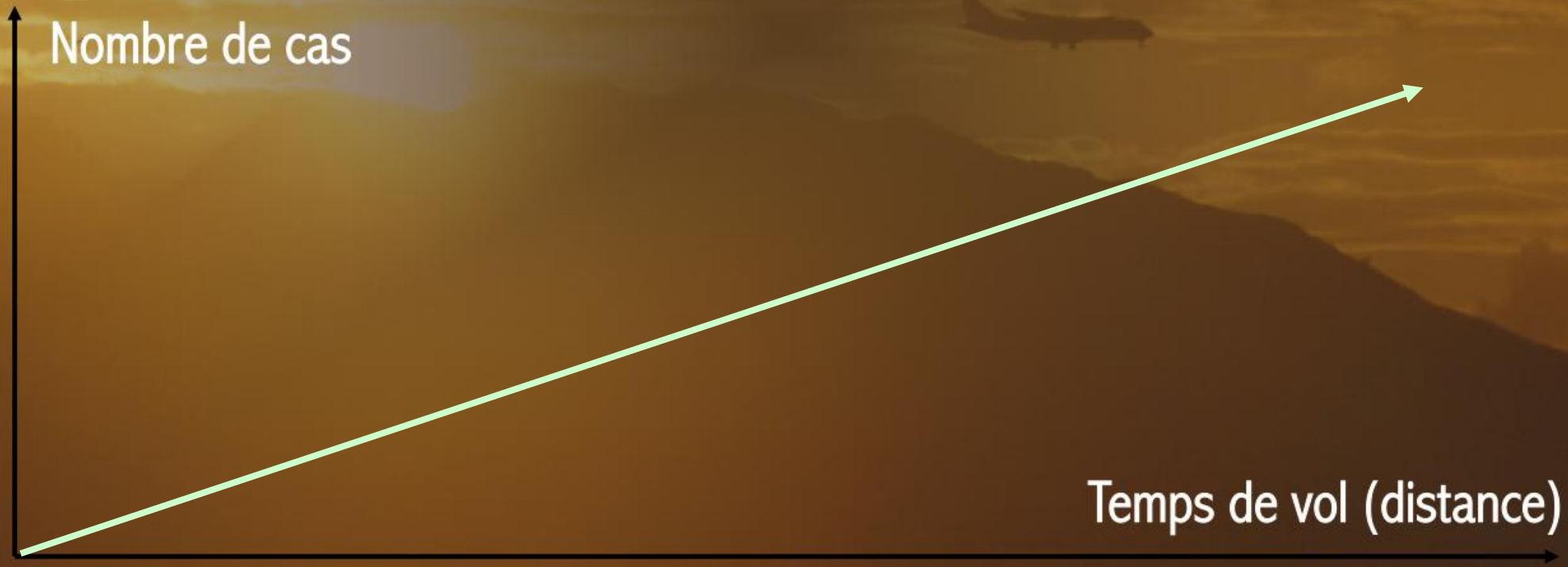


« Problem with the assessment of risk factors for venous thromboembolism. »

Egermayer, *Chest*, 2001

136 millions de passagers

56 embolies pulmonaires

Age moyen : 57 ± 12 ans

42 femmes/14 hommes

« Problem with the assessment of risk factors for venous thromboembolism. »

Egermayer, *Chest*, 2001

136 millions de passagers

56 embolies pulmonaires

Age moyen : 57 ± 12 ans

42 femmes/14 hommes


0,4 cas/million passagers

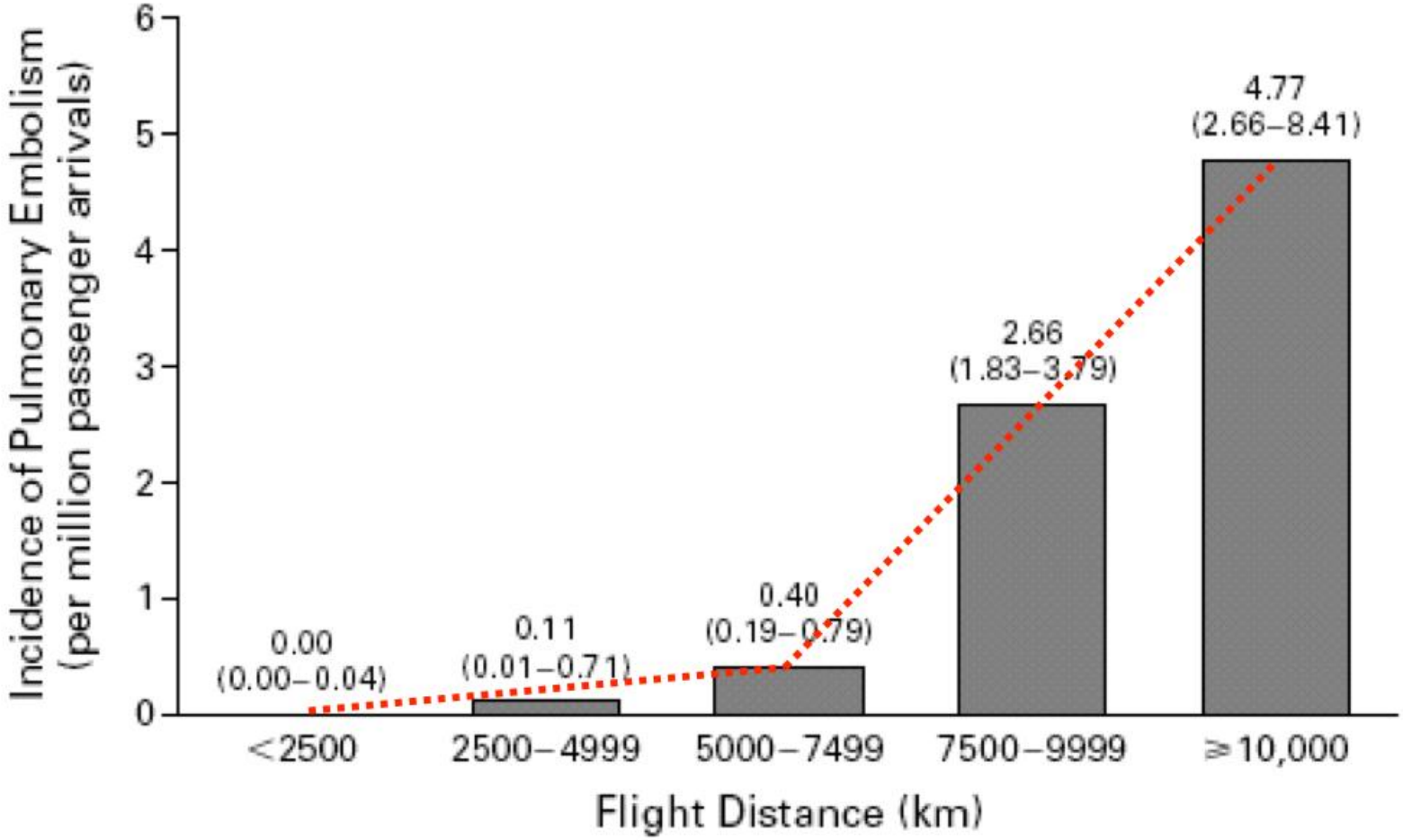
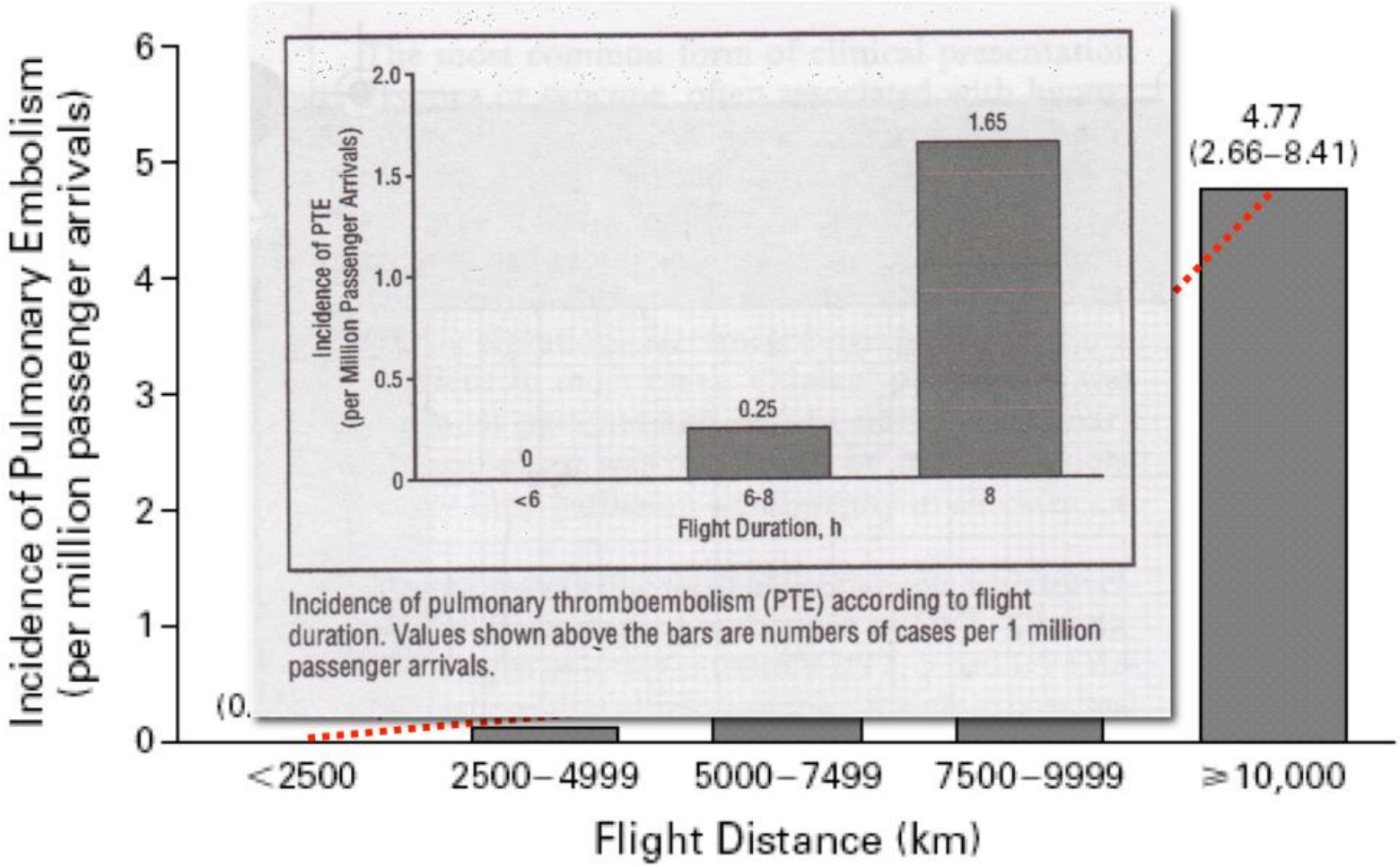



**Figure 1.** Incidence of Pulmonary Embolism According to Distance Traveled by Air.

Values shown above the bars are numbers of cases per million passenger arrivals, with 95 percent confidence intervals. To convert kilometers to miles, multiply by 0.62.

Lapostolle, *NEJM*, 2001

Pèrez-Rodriguez, *Arch Intern Med*, 2003

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Lapostolle, *NEJM*, 2001

# Incidence sous-estimée

1. Patients avec thrombose veineuses profonde non inclus
2. Patients sans gravité non inclus
3. Patients avec arrêt cardiaque en vol ou à arrivée non inclus

# Quels facteurs de risque spécifiques ?

EDITORIAL | Annals of Internal Medicine

## Travel and Venous Thrombosis: An Exercise in Thinking About Bias

In a meta-analysis in this issue, Chandra and colleagues (1) conclude that the best estimate of the effect of travel on venous thrombosis (VT) is a close to 3-fold increase in risk. To arrive at that conclusion, they exclude the case–control studies in which the controls were referred with the suspicion of VT, like the case patients, but tested negative for VT. These studies found no excess risk. Their exclusion from the analysis might surprise readers; controls with the same reasons for referral who came from the same population would seem ideal. Our purpose is to discuss the selection of controls for case–control studies, using Chandra and colleagues' article as an example. Our principal conclusion is that Chandra and colleagues' explanation of their results goes in the right direction but is incomplete.

Chandra and colleagues removed case–control studies that used referred controls from their final analysis because, they argue, investigators make a mistake when they think that controls in a case–control study should resemble case patients as closely as possible (1). Making groups as equal as possible is the usual reasoning in follow-up studies or fluence of diagnostic suspicion bias in case–control studies. One way to avoid this bias is to study only patients with severe symptoms, who would always be referred for work-up, so that diagnostic suspicion bias should play no role. The association between oral contraceptives and VT remained equally strong in studies that enrolled only women with severe symptoms (see references in Bloemenkamp and colleagues' study [3]). Another strategy is to use referred patients as controls. If physicians preferentially refer women who use oral contraceptives and have leg symptoms, the frequency of oral contraceptive use will be the same in referred persons with and without VT—unless contraceptives are truly associated with VT. Studies that used this design yielded the same risk estimates as studies with nonreferred controls (3, 4), which suggests that diagnostic suspicion bias does not play a major role in the association of oral contraceptives with VT. Use of referred controls also helped to exclude potential bias in the association between aspirin and the Reye syndrome, another major controversy (5).

Vandenbroucke, *Ann Intern Med*, 2009

# Quels facteurs de risque spécifiques ?

EDITORIAL | Annals of Internal Medicine

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major controversy (5).

Vandenbroucke, *Ann Intern Med*, 2009

| | Venous thromboembolism (n=9) | No venous thromboembolism (n=869) | All |
|---|---|---|---|
| Age (mean [SD], years) | 54·3 (11·5) | 49·0 (11·8) | 49·0 (11·8) |
| Body-mass index (mean [SD], kg/m²) | 27·3 (3·1) | 25·7 (4·4) | 25·8 (4·4) |
| Aspirin use | 5/9 (56%) | 270/869 (31%) | 275/878 (31%) |
| Comorbid conditions | 5/9 (56%) | 314/869 (36%) | 319/878 (36%) |
| Economy-class travel | 7/9 (78%) | 711/869 (82%) | 718/878 (82%) |
| Family history of venous thromboembolism | 1/9 (11%) | 95/864 (11%) | 96/873 (11%) |
| Female | 6/9 (67%) | 438/869 (50%) | 444/878 (51%) |
| Hormone use in women | 4/6 (67%) | 124/438 (28%) | 128/444 (29%) |
| Symptoms of deep vein thrombosis | 5/9 (56%) | 283/869 (33%) | 288/878 (33%) |
| Symptoms of pulmonary embolism | 3/8 (38%) | 87/869 (10%) | 90/877 (10%) |
| Compression stocking use | 4/9 (44%) | 142/869 (16%) | 146/878 (17%) |
| Thrombophilic risk factor* | 2/9 (22%) | 51/618 (8%) | 53/627 (8%) |

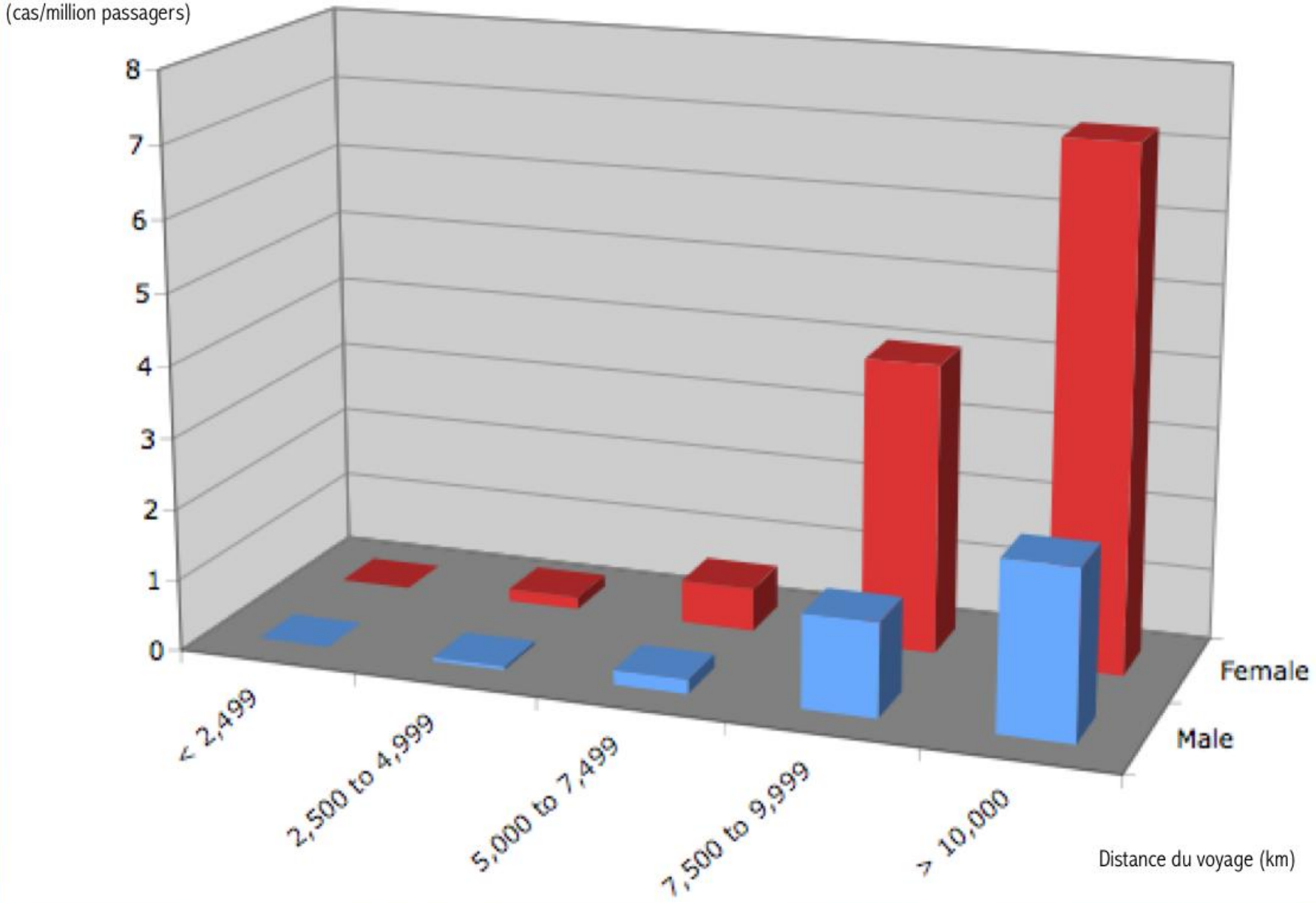
Continuous variables are presented as mean (SD) and categorical variables as number of participants/number with information available (%). *Factor V Leiden gene mutation, prothrombin A20210G gene mutation, antithrombin III deficiency, anticardiolipin antibody positive.

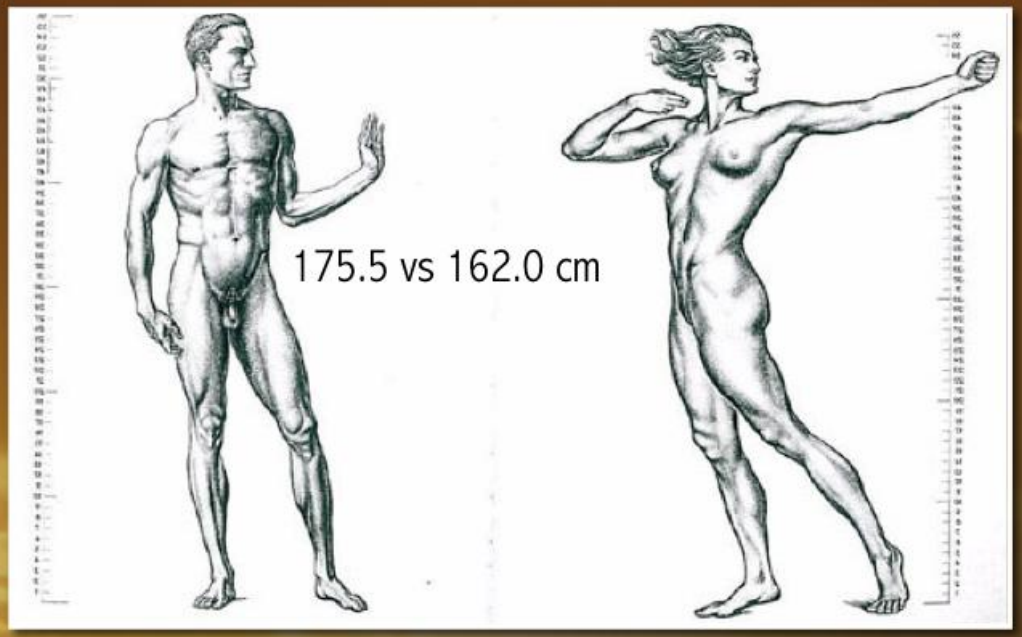
*Hughes, Lancet*, 2003

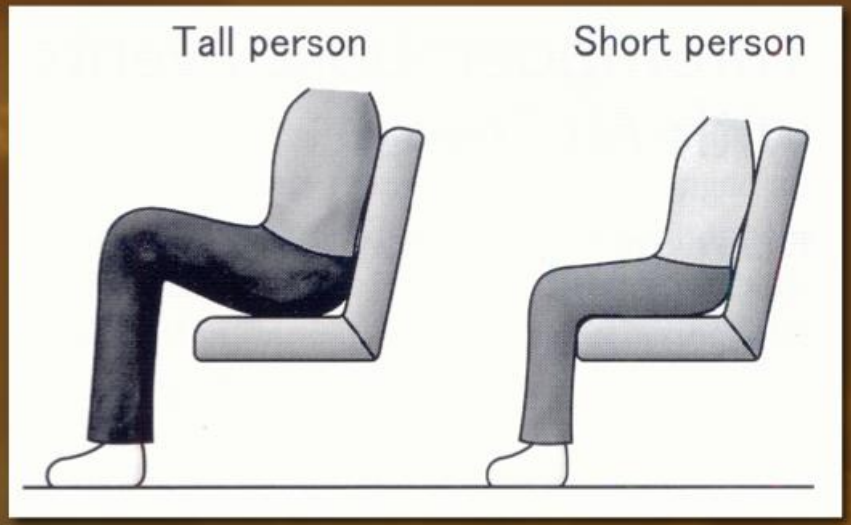
Rôle de la ‘’physique du vol’’ non démontré

Rôle classe du vol non démontré.

Lapostolle, *Thromb Haemost*, 2009






Morio, *Circ J*, 2005

# Etude de cohorte : 8.755 employés de compagnies internationales suivis pendant 5 ans

| Category | Air Travel[a] | Cases | Person-Years | IR/1,000 PY (95% CI) | IRR (95% CI)[b] | Flights | Risk/Flight[c] | Case/Number of Flights[d] |
|---|---|---|---|---|---|---|---|---|
| <165 cm | No | 5 | 7,284 | 0.7 (0.2–1.5) | Reference | | | |
| | Yes | 7 | 1,108 | 6.3 (2.4–12.0) | 9.8 (3.1–30.9) | 14,250 | 49.1 | 1/2,036 |
| 165–185 cm | No | 21 | 16,759 | 1.3 (0.8–1.9) | Reference | | | |
| | Yes | 11 | 4,602 | 2.4 (1.2–4.0) | 1.9 (0.9–3.9) | 69,095 | 15.9 | 1/6,281 |
| >185 cm | No | 3 | 3,493 | 0.9 (0.2–2.1) | Reference | | | |
| | Yes | 4 | 1,115 | 3.6 (0.9–8.1) | 3.7 (0.8–16.9) | 18,242 | 21.9 | 1/4,561 |

Kuipers, *PLoS Medicine*, 2007

# Etude cas témoin, patients avec atcd de TVP ou EP
# Voyage en avion récent ou non

| | Patient N=54 | Control N=108 | |
|---|---|---|---|
| Female | 33 (61%) | 71 (68%) | 0.55 |
| Age (years) | 44 (32-55) | 47 (38-55) | 0.17 |
| Height (cm) | 170 (163-176) | 169 (164-177) | 0.78 |
| Weight (kg) | 69 (58-81) | 74 (62-87) | 0,10 |
| BMI | 23 (21-27) | 25 (22-29) | 0.10 |

Belhacene, *Urgences 2012*

# Etude cas témoin, patients avec atcd de TVP ou EP
# Voyage en avion récent ou non

| | Patient N=54 | Control N=108 | |
|---|---|---|---|
| Anomalies de l'hémostase | 16 (30%) | 21 (20%) | 0,12 |
| Résistance PCA | 6 (11%) | 9 (8%) | |
| Facteur II | 4 (7%) | 7 (6%) | |
| Facteur V Leiden | 6 (11%) | 9 (8%) | |
| Activation plaquettaire | 1 (2%) | 0 (0%) | |

Belhacene, *Urgences 2012*

# Etude cas témoin, patients avec atcd de TVP ou EP
# Voyage en avion récent ou non

| | Patient N=54 | Control N=108 | |
|---|---|---|---|
| Total risk score | 3 (3-3) | 6 (6-9) | 0.0007 |
| Major risk factor | 0.0 (0.0-0.0) | 0.0 (0.0-3.0) | 0.0009 |
| Minor risk factors | 0.5 (0.0-1.0) | 1.5 (0.0-2.0) | 0.37 |

Belhacene, *Urgences 2012*

# Principal facteur de risque : voyage lui même

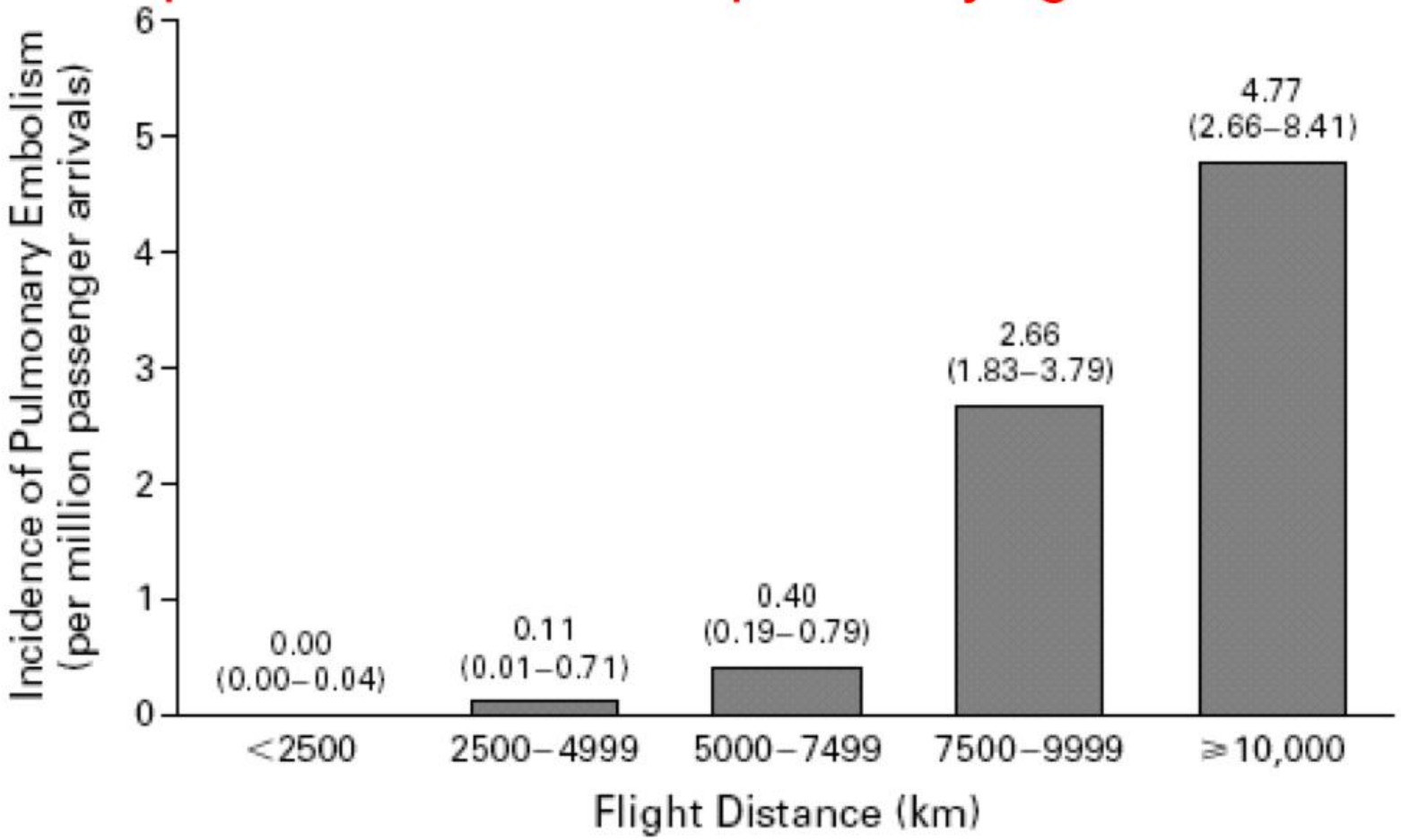



**Figure 1.** Incidence of Pulmonary Embolism According to Distance Traveled by Air.

Values shown above the bars are numbers of cases per million passenger arrivals, with 95 percent confidence intervals. To convert kilometers to miles, multiply by 0.62.

Lapostolle, *NEJM*, 2001

# Prophylaxie

Pour quels patients ?

Pour quels voyages ?

Quelle prophylaxie ?

# Recommandations


- Schobersberger W, Toff WD, Eklof B, et al. Traveller's thrombosis: international consensus statement. *Vasa* 2008;37:311-7.

- Watson HG, Baglin TP. Guidelines on travel-related venous thrombosis. *Br J Haematol* 2011;152:31-4.

- Kahn SR, Lim W, Dunn AS, et al. Prevention of VTE in nonsurgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012;141:e195S-226S.

# Pour quel patient ?

| | |
|---|---|
| Groupe 1<br>Risque faible | Passagers sans risque personnel supplémentaire (voir ci-dessous)<br>Chaque voyage prolongé est associé à un risque légèrement accru mais indéterminé |
| Groupe 2<br>Risque moyen | Facteurs augmentant le risque individuel. Après 2, augmentation supra-additive<br>- Grossesse ou post-partum<br>- Age > 60 ans<br>- Thrombophilie documentée<br>- Antécédents familiaux de maladie thrombo-embolique<br>- Varices des membres inférieurs et/ou insuffisance veineuse chronique<br>- Contraception orale ou traitement hormonal substitutif<br>- Obésité (index de masse corporelle > 30) |
| Groupe 3<br>Risque élevé | - Antécédents thrombo-embolique<br>- Néoplasie ou autre pathologies sévère évolutive<br>- Immobilisation (plâtre….)<br>- Chirurgie majeure récente |

Schobersberger, *VASA*, 2008

# Prophylaxie comportementale

- Proscrire les sédatifs
- Eviter de plier & croiser jambes
- Boire abondamment
- Limiter les boissons alcoolisées & le tabac
- Limiter les vêtements compressifs
- Favoriser les mouvements & la déambulation

# Prophylaxie physique

## Mouvements et déambulation

Noddeland, *Eur J Appli Physiol*, 1988, Landgraf, *Aviat Space Environ Med*, 1994

## Port de bas de contention

Scurr, *Lancet*, 2001 ; Belcaro (Lonflit II), *Angiology*, 2001

| Etude Lonflit II | Contention | Contrôle |
|---|---|---|
| Haut risque + voyage 10-15 h | 422 | 411 |
| Thrombose veineuse échographique | 0,2% | 4,5% |

($p<0,05$)

# Prophylaxie pharmacologique

Veinotoniques et aspirine : inutiles

Héparine de bas poids moléculaire (pas d'AMM)

| Etude Lonflit III | Aspirine | HBPM | Contrôle |
|---|---|---|---|
| Haut risque - voyage 10-15 h | 84 | 82 | 82 |
| Thrombose veineuse échographique | 3,6% | 0,6% | 4,8% |

Cesarone, *Angiology*, 2002

*(p<0,002)*

# Stratégie prophylactique

## Mesures

*Group 1: Low risk*

*General measures*

- Perform regular leg exercises, e.g. ankle movements, isometric exercises, walking. During travel by car and bus, take regular breaks to walk about
- Maintain normal fluid intake (at least 250ml every 2 hours) and avoid excessive alcohol consumption
- Avoid the use of tranquillisers and sleeping pills whilst in the sitting position

Comportementales

*Group 2: Medium risk*

- General measures, as for Group 1
- Graduated compression stockings (compression at least 10-20 mmHg but 20-40 mmHg in subjects with chronic venous insufficiency)
- In special cases, consider low-molecular weight heparin, as for Group 3

Physiques

*Group 3: High risk*

- General measures, as for Group 1
- Graduated compression stockings (at least 10-20 mm Hg compression but 20-40 mm Hg in subjects with chronic venous insufficiency
- Consider low-molecular weight heparin

Pharmacologiques

Schobersberger, *VASA*, 2008

# Prophylaxie : synthèse

| | < 3 heures | 3 à 8 heures | > 8 h |
|---|---|---|---|
| **Faible** | Rien | Rien | Rien |
| **Intermédiaire** | Rien | Rien<br>ou contention | Contention |
| **Elevé** | Rien | Contention | Contention<br>± anticoagulants |

# Recommendations

CHEST

Kahn, 2012

and found a symptomatic VTE incidence of 0.91 per 100 person-years. Similarly, a retrospective study of 18,661 nursing home patients in Kansas found a VTE incidence of 1.30 per 100 person-years.[115] These studies suggest that the best estimate of the annual incidence of symptomatic VTE in nursing home patients is approximately 1%. The use of anticoagulant prophylaxis has not been examined adequately in this population to draw conclusions on whether the benefits outweigh the risks and costs.

The incidence of VTE in postacute care facilities was examined in a prospective cohort study of 3,039 patients admitted for rehabilitation after acute medical illness or surgery.[116] Reasons for admission to the facility included medical illness (54.7%), stroke (21.1%), and surgery (31.7%). Most patients (75.1%) received anticoagulant thromboprophylaxis, which was primarily LMWH. The incidence of symptomatic VTE was 2.4% during the stay at the facility (median duration 26 days). Risk factors for VTE were cancer and prior VTE.

Two cross-sectional studies examined the prevalence of asymptomatic DVT in elderly patients in postacute care facilities in France and detected asymptomatic DVT in 14.0% and 15.8% of patients, respectively.[116,150] A subsequent analysis that combined data from these two studies noted that although proximal DVT was not significantly reduced among patients who received LMWH prophylaxis (5.7% vs 4.0%; $P = .16$), this difference became statistically significant with the use of propensity analysis to control for potentially confounding variables (OR, 0.56; $P = .03$).[151] These studies suggest that the incidence of asymptomatic DVT in elderly patients in postacute care facilities is similar to that of hospitalized patients. However, their observational designs and lack of patient-important end points does not allow for any conclusions to be drawn on whether thromboprophylaxis is of benefit in this population (Table S23).

The available data suggest that nursing home patients have an incidence of symptomatic VTE of 1% annually and postacute care patients have an incidence of 1.0% to 2.4% during their stay at the facility. These data offer some indirect support for prophylaxis of immobile patients in postacute or subacute care facilities, as their incidence of VTE may be similar to that of acutely ill hospitalized patients. Randomized trials are needed to determine if the benefits of anticoagulant thromboprophylaxis outweigh the risks in this population.

Recommendation

**3.1. In chronically immobilized persons residing at home or at a nursing home, we suggest against the routine use of thromboprophylaxis** (Grade 2C).

## 6.0 Long-Distance Travel

### *6.1 Risk of VTE*

Prolonged air travel results in a very small absolute incidence of VTE. A systematic review and meta-analysis of 14 studies (11 case-control, two cohort, and one case-crossover) of risk for VTE in travelers demonstrated a pooled RR of 2.8 (95% CI, 2.2-3.7). A dose-response relationship was identified, with an 18% higher risk of VTE for each 2-h increase in travel duration.[125,152] However, the overall absolute incidence of a symptomatic VTE in the month following a flight > 4 h is 1 in 4,600 flights,[124] with a reported incidence of asymptomatic VTE on arrival from a trip ranging from 0% to 1.5%.[153] The incidence varies by the type and duration of travel and by individual risk factors.[126,127] Thrombosis risk also appears to be increased for travel by car, bus, or train.[128,130]

The association between air travel and VTE is strongest for flights > 8 to 10 h[125,128,131,133] and is increased in the presence of VTE risk factors such as recent surgery.[125] For those on flights > 4 h, immobility during the flight and window seating (especially for obese persons) also increase the risk of VTE.[134] Especially tall or short passengers may have an increased risk.[130] There is no definitive evidence that dehydration, travel in economy class, and drinking alcoholic beverages on the flight are related to VTE risk.

Most individuals with travel-associated VTE have one or more known risk factors for thrombosis, including previous VTE, recent surgery or trauma, active malignancy, pregnancy, estrogen use, advanced age, limited mobility, severe obesity, or a thrombophilic disorder.[125,130,132,135,142] Among healthy volunteers, coagulation activation observed after an 8-h flight was greater in carriers of factor V Leiden and in women taking oral contraceptives.[141] Case-control studies have reported an increased risk of VTE in travelers who have thrombophilia and use oral contraceptives.[130,136]

We identified a Cochrane review[142] of nine RCTs of thromboprophylaxis in long-distance air travelers (Tables S24, S25). All but one of these trials was conducted by a single group of investigators.[140,143,150] Trials enrolled a mix of low- and increased-risk subjects based on risk factors for VTE, and most studies included persons taking flights of > 7 h. Asymptomatic DVT detected by screening ultrasound examination was the primary end point. All of the trials have methodologic limitations that compromise their interpretation. Further, the UK General Medical Council's Fitness to Practice Panel judged that these papers included coauthors who had not approved the papers and erased the principal investigator from the register of the General Medical Council.[153] Regardless, as there

Recommendations

CHEST

Kahn, 2012

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Recommendations

CHEST

Kahn, 2012

**6.1.1. For long-distance travelers at increased risk of VTE (including previous VTE, recent surgery or trauma, active malignancy, pregnancy, estrogen use, advanced age, limited mobility, severe obesity, or known thrombophilic disorder), we suggest frequent ambulation, calf muscle exercise or sitting in an aisle seat if feasible** (Grade 2C).

Recommendations

CHEST

Kahn, 2012

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**6.1.2. For long-distance travelers at increased risk of VTE (including previous VTE, recent surgery or trauma, active malignancy, pregnancy, estrogen use, advanced age, limited mobility, severe obesity, or known thrombophilic disorder), we suggest use of properly fitted, below-knee GCS providing 15 to 30 mm Hg of pressure at the ankle stockings during travel** (Grade 2C). **For all other long-distance travelers, we suggest against the use of GCS** (Grade 2C).

Recommendations

CHEST

Kahn, 2012

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**6.1.3. For long-distance travelers, we suggest against the use of aspirin or anticoagulants to prevent VTE** (Grade 2C).

# Prophylaxie : synthèse

| | | Patient | | |
|---|---|---|---|---|
| Voyage | Prophylaxie | Risque faible | Risque modéré | Risque élevé |
| | < 5000 km | Niveau 1 | Niveau 2 | Niveau 2 |
| | 5000 à 7500 km | Niveau 1<br>Niveau 2 | Niveau 2 | Niveau 3 |
| | > 7500 km | Niveau 2 | Niveau 3 | Niveau 3 |

# Air Travel–Related Deep Vein Thrombosis and Pulmonary Embolism

**Deep vein thrombosis** occurs when a blood clot forms in the deep veins of the leg and obstructs the flow of blood back to the heart. This can lead to swelling of the leg and pain in the calf muscle, although sometimes there are no symptoms. **Pulmonary embolism** occurs when blood clots leave the veins where they developed, travel through the right side of the heart, and lodge in the small or large branches of the blood vessels going to the lung (**pulmonary arteries**). This can cause symptoms such as chest pain, difficulty breathing, or coughing up blood. In severe cases, it may result in collapse and sudden death. Long airplane flights or multiple flights in a short period can be associated with deep vein thrombosis and pulmonary embolism. Any situation in which the leg is bent at the knee for prolonged periods without much active motion may lead to a reduction of blood flow and increase the risk of blood clots. Other factors can increase this risk, such as recent surgery, taking oral contraceptives or hormone therapy, pregnancy, cancer, heart problems, and older age. Inherited genetic factors may also play a role.

## PREVENTION

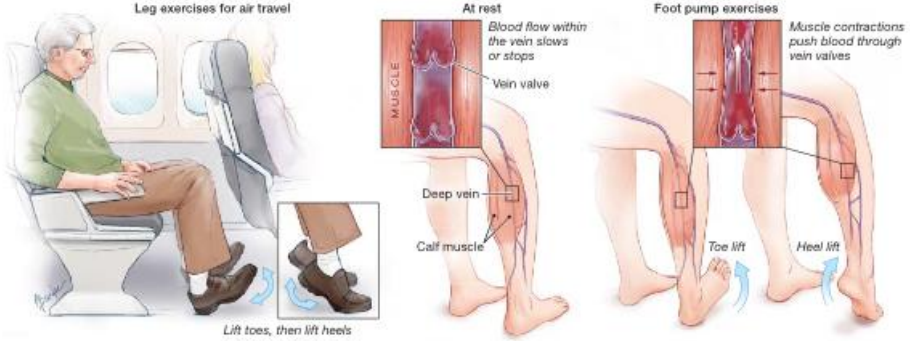
- Properly fitted graduated compression stockings have been shown to be of some value.
- For people at high risk, such as those who have had a previous episode of thrombosis, low-molecular-weight heparin can be prescribed by a primary care physician and can be self-administered by injection beneath the skin just prior to a flight.
- Getting up frequently and walking in the aisle of the plane increases blood flow and may reduce the risk of clots forming but is not always practical or safe.
- The simplest preventive measure is to frequently "pump your feet" while sitting in your seat. Alternately lifting the toes and then lifting the heels increases blood flow in the calf veins and reduces the risk of forming blood clots.

## FOR MORE INFORMATION

- World Health Organization Research Into Global Hazards of Travel (WRIGHT) Project
  www.who.int/cardiovascular_diseases/wright_project/phase1_report/WRIGHTREPORT.pdf
- The Surgeon General's Call to Action to Prevent Deep Vein Thrombosis and Pulmonary Embolism
  www.surgeongeneral.gov/library/calls/deepvein/call-to-action-on-dvt-2008.pdf

## INFORM YOURSELF

To find this and previous *JAMA* Patient Pages, go to the Patient Page link on *JAMA*'s website at www.jama.com. Many are available in English and Spanish. A Patient Page on thrombophlebitis was published in the April 6, 2011, issue of *JAMA* and one on pulmonary embolism in the January 11, 2006, issue.

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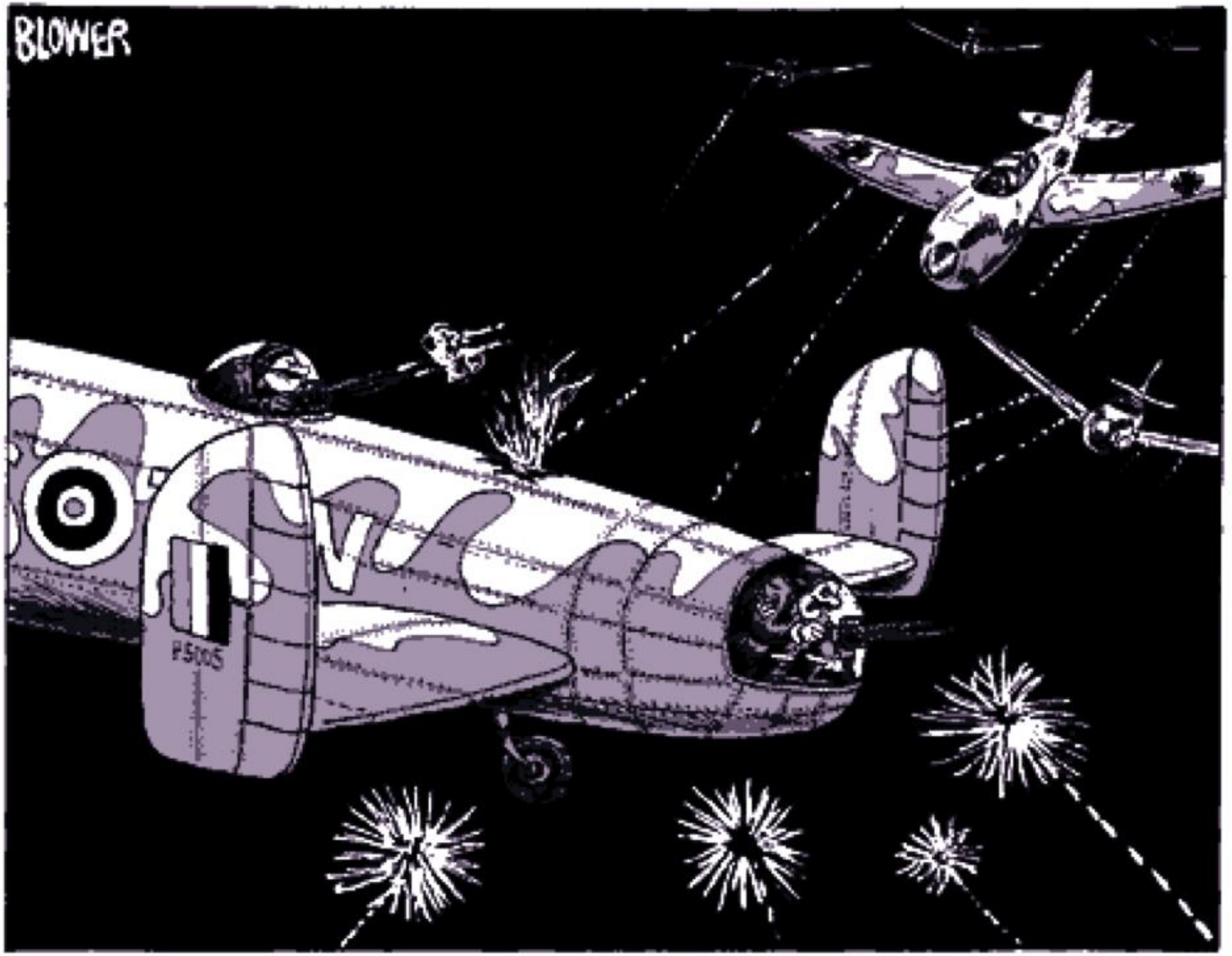
**NEWS ITEM: EXPERTS CLAIM THAT 2,000 DIE EVERY YEAR FROM DVT ON LONG-HAUL FLIGHTS**




**"Of course what really scares me is the deep vein thrombosis risk"**

*D'après Patrick Blower*
*Thisislondon. 11/01/2001*
*With autorization*


Foto FLapo, 2002