

Non-Communicable Diseases Watch

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Air Travel and Risk of Venous Thromboembolism

Key Facts

- ※ Venous thromboembolism (VTE) consists of two related conditions caused by blood clots: deep vein thrombosis (DVT) and pulmonary embolism (PE).
- ※ DVT is a condition in which a blood clot develops in one of the deep veins, most commonly in the lower legs. If part of the clot breaks off, travels and becomes lodged in the blood vessels of the lungs, it will cause PE.
- ※ In healthy individuals, the risk of VTE per more than 4-hour flight is about 1 in 6 000. The risk would increase with increasing travel duration, multiple flights within a short period, and pre-existing risk factors for VTE.

VTE Prevention Tips for Air-Travellers

- ※ For all air travellers, here are some measures to be taken during the flight to reduce the risk of VTE:
 - * Do regular foot and leg exercises. When flight condition permits, take occasional short walks in the aisle to keep circulation active and prevent blood pooling in legs.
 - * Store luggage in luggage compartments rather than at the feet to avoid restricting leg movement.
 - * Wear loose-fitting clothing, especially around the waist and lower legs.
 - * Drink adequate amounts of water. Do not drink alcohol and avoid caffeinated beverages (such as tea, coffee and cola) which promote water loss in urine.
- ※ For individuals who are at high risk of VTE, advice from family doctor should be sought prior to the flight.
- ※ Should a suspected VTE event occur during or after the travel, medical care should be sought immediately.

Air Travel and Risk of Venous Thromboembolism

Every day, hundreds of thousands of people embark on international air travel and spend hours in an airplane. However, there are certain health risks associated with this distinctive mode of travel, and one of which is venous thromboembolism (VTE).

VTE consists of two related conditions caused by blood clots: deep vein thrombosis (DVT) and pulmonary embolism (PE). DVT is a condition in which a blood clot develops in one of the deep veins, most commonly in the lower legs. If part of the clot breaks off, travels and becomes lodged in the blood vessels of lungs, it will cause PE and that can be life-threatening in severe cases. While DVT can be asymptomatic, common symptoms of blood clots in deep leg vein of the affected leg are pain, swelling and redness. PE can cause symptoms such as chest pain, rapid and/or irregular heartbeat, difficulty in breathing, or coughing up blood. In severe cases, it may result in collapse and sudden death.

In fact, VTE has long been postulated as a potential complication of long-distance air travel. At flight, prolonged immobility in a sitting position can lead to a reduced velocity of venous blood flow in the lower limbs and increased blood viscosity, two conditions that favour the formation of a blood clot. The LONFLIT study aimed to evaluate the incidence of DVT occurring as a consequence of long flights (mean flight duration of 12.4 hours). It found that 76% of thrombotic events occurred in passengers sitting in window or central seats where they tended to move less¹, suggesting a potential role of decreased leg mobility in VTE

development.^{2,3} In addition to immobility, other factors that possibly increase the risk of VTE including in-flight dehydration and hypobaric hypoxia in cabin which can trigger blood clot formation.²⁻⁴ However, the association between dehydration or hypobaric hypoxia in air travel and VTE still remains controversial.^{5,6}

VTE Risk for Air Travellers

The WHO Research into Global Hazards of Travel (WRIGHT) Project estimated that the absolute risk of VTE per more than 4-hour flight with prolonged immobility, in a cohort of healthy individuals, was about 1 in 6 000.⁵ Depending on methodologies, studies show that the risk of VTE after long-distance air travel (4 hours or more) ranged from 70% to 3 times greater when compared with not travelling.⁷⁻⁹

In fact, anyone travelling more than four hours, whether by air, car, bus, or train, can be at risk of VTE.

For air travellers, the risk increases with increasing travel duration. A meta-analysis of three studies showed a 26% higher risk of VTE for every 2 hours increase in duration of air travel.¹⁰ The risk of VTE also increases with multiple flights within a short period. A cohort study of over 8 700 employees of international organizations found that VTE risk was 2.5, 4.2 and 6.9 times as likely after exposure to 1-2, 3-4, and 5 or more flights of at least 4 hours respectively compared with no flight longer than 4 hours in the preceding 8 weeks.⁸ Moreover, risk of VTE increases for those air travelers with predisposing risk factors (Box 1).

Box 1: Major risk factors for VTE ^{11,12}

- * Advancing age, from 40 years onwards
- * Presence of blood-clotting abnormalities, such as thrombophilia
- * Use of oral contraceptives or hormone replacement
- * Pregnancy and the postpartum period (up to 6 weeks after childbirth)
- * Previous history of VTE or a family history of VTE
- * Serious medical illness, such as active cancer, congestive heart failure, inflammatory bowel disease
- * Recent surgery (within 3 months)
- * Varicose veins
- * Overweight and obesity
- * Limited mobility, e.g. cast on leg

Among people with risk factors for DVT (including a previous history of DVT, large varicose veins, documented coagulation disorders, severe obesity, neoplastic disease within the past 2 years, or limitation of mobility due to bone or joint problems), the LONFLIT study found an incidence of DVT of 2.8% after 10-15 hours of flights while no event was recorded in low-risk people.¹ Furthermore, air travellers with pre-existing thrombophilia were about 16 times as likely to develop VTE compared with individuals who did not fly or have thrombophilia.⁹ In pregnant women who travelled by air, the risk of VTE was estimated to be 0.03%-0.1%.¹³ Among women during childbearing age, compared with those who did not fly or use oral contraceptives, women who travelled by air and concurrently used oral contraceptives were about 14 times as likely to develop VTE.⁹ Compared with non-

travelling people with a body mass index (BMI) <25, air travellers with a BMI 25-30 and BMI >30 were about 4 times and 7 times respectively as likely to have DVT. Specific to air travel, shorter stature of <160 cm was also associated with about 7 times the risk of DVT and that could be explained by seat-edge pressure to the popliteal vein (one of the main blood vessels located behind the knee) when the short-legged individuals do not touch the floor.⁷ It is also noteworthy that most episodes of serious DVT or PE occur during or immediately after flight. However, they may occur many hours or even days later. After a long-distance flight, studies have shown that the risk of VTE remains high within the first two weeks.^{8,14}

Recommendations for Air Traveller

The absolute risk of VTE for ‘young and healthy’ air travellers without pre-existing risk factors is low. However, many people may not be aware that they are at risk of VTE. The risk of VTE among long-distance travellers is still higher than that of healthy subjects who are not flying. For all air travellers, here are some measures to be taken during the flight to reduce the risk of VTE:

- ✓ **Do regular foot and leg exercises** to keep the circulation active, e.g. toe lift, heel lift, ankle movement and isometric exercise. **When flight conditions permit, take occasional short walks in the aisle.** Even in young healthy people, a study showed that blood volume flow in the popliteal vein could reduce by about 40% with seated immobility, and by almost two-fold when sitting motionless with no contact of the feet with the floor.¹⁵

- ✓ **Store luggage in luggage compartments** rather than at the feet to avoid restricting leg movement.
- ✓ **Wear loose-fitting clothing**, especially around the waist and lower legs.
- ✓ **Drink adequate amounts of water. Do not drink alcohol and avoid caffeinated beverages** (such as tea, coffee and cola) which are dehydrating.

For those individuals who are at high risk of VTE, they should discuss with their family doctor prior to the flight. According to the degree of risk, the doctor may suggest additional preventive measures including use of properly fitted compression stockings or anticoagulant drugs. Should a suspected VTE event occur during or after the travel, seek medical care immediately. For more information regarding travel health, please visit the Hong Kong Travel Health Service website of the Department of Health at <http://www.travelhealth.gov.hk/>.

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How to Balance Vacation **Fun & Healthy** Lifestyle

You do NOT have to give up your healthy living habits during international travel. Here are some tips for keeping up with your healthy eating and active living habits.

Eat well and know what to choose

- Choose dishes with vegetables as main ingredients, or dishes with low fat ingredients (such as lean meat, skinless poultry, etc.) prepared by low fat cooking methods (such as steaming, baking, grilling or boiling in soup). Choose fresh fruits or fruit-based options as desserts or snacks while traveling in cars.
- Be cautious of additional sources of oil and salt to the dishes, e.g. chili oil, oyster sauce, soy sauce and gravy. Ask the restaurants to serve sauces separately if possible.
- Be aware of portion size. Share dishes with your travel companion(s) so that you can try more dishes while keeping the portions small.
- Eat sensibly and slowly. Allow at least 20 minutes to finish your meal and eat to 70-80% full.
- Be aware of 'liquid calories'. Bring your own water bottle during sightseeing so that you could drink water instead of sugary drinks.



Take every opportunity to be more physically active

- Wake up a little bit earlier or spare some time during the day to do exercise. Use the exercise/recreation facilities (such as swimming pool, gym or health club) provided by the hotel.
- Walk through the lobby or hallway of the hotel or a nearby shopping mall.
- Choose to climb the stairs instead of taking the lift and escalators inside the hotel or when you tour around.
- Tour on foot as much as you possibly can.
- Get out of the car/bus and stretch your legs after a long drive.



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Non-Communicable Diseases (NCD) WATCH is dedicated to promote public's awareness of and disseminate health information about non-communicable diseases and related issues, and the importance of their prevention and control. It is also an indication of our commitments in responsive risk communication and to address the growing non-communicable disease threats to the health of our community. The Editorial Board welcomes your views and comments. Please send all comments and/or questions to so_dp3@dh.gov.hk.

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