



Royal College of
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Air Travel and Pregnancy

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This is the third edition of this paper, which was published in 2001 and 2005 under the title ‘Advice on Preventing Deep Vein Thrombosis (DVT) for Pregnant Women Travelling by Air’.

1. Background

Obstetricians are commonly asked to give advice on whether it is suitable for women who are pregnant to fly during pregnancy. Such advice is sought because of the physiological and environmental changes associated with commercial air travel and also because of the possibility of preterm labour or an obstetric emergency developing while in flight, particularly in those women who are approaching 37 weeks of gestation or who have risk factors for preterm labour.

1.1 Cabin altitude

The key change in environment associated with commercial air travel is the cabin altitude. Although cabins are pressurised, this will equate to a cabin altitude of between 4000 and 8000 feet at cruising altitude. Thus, the barometric pressure is significantly lower than at sea level and there will be a concomitant reduction in the partial pressure of oxygen, in turn resulting in a reduction in blood oxygen saturation by around 10%. Such a reduction does not pose a problem for healthy individuals and this remains so in pregnancy. Owing to the higher count of red blood cells in the fetal circulation and the favourable properties of fetal haemoglobin, there is considered to be little, if any, change in fetal oxygen pressures.¹ Humidity in aircraft cabins is low at around 15%, reflecting the lower ambient humidity at altitude. While this leads to an increase in insensible fluid loss, this is insufficient to cause dehydration, although drying of mucous membrane occurs. With regard to any adverse effects of air travel on pregnancy, there are no good data to suggest that commercial airline travel is associated with an increase in risk of adverse pregnancy outcome in terms of preterm labour, preterm rupture of the membranes or abruption. A systematic review of publications on pregnancy complications and air travel indicated that the methodological quality of the reviews was not particularly high.² These data suggest a greater risk of pregnancy loss (spontaneous miscarriage or intrauterine fetal death) in flight attendants compared to controls (odds ratio [OR]: 1.62, 95% CI 1.29–2.04). There was also a greater risk of preterm birth less than 37 weeks of gestation in air passengers (OR: 1.44, 95% CI 1.07–1.93), but not in flight attendants, emphasising the inconsistency of these findings with regard to a causative link to air travel.² Given the small increase in relative risk reported, methodological limitations and inconsistencies in these data, it would be inappropriate to rely on this to estimate risk or recommend an intervention.

Although there is no clear direct risk of pregnancy complications for passengers, the cabin changes can be associated with increased risk of discomfort and medical complications in the mother. With increasing altitude and reduction in barometric pressure, gases expand. This most frequently leads to problems within the ear, particularly if there is nasal congestion, which is more common because of the vasodilatation of pregnancy. For some women, motion sickness will be a problem and this may accentuate morning sickness. The duration of the flight will lead to significant immobility and increased risk of leg oedema and DVT. In addition, when coupled with the physiological changes in the coagulation system in pregnancy this may accentuate the risk of thrombosis, particularly if further risk factors are present, such as previous DVT or obesity.

1.2 Cosmic radiation

The increased cosmic radiation exposure associated with flying is not considered significant in terms of risk to the mother or fetus for occasional flights.³ Aircrew have restrictions on their level of radiation exposure and many airlines do not allow aircrew to fly while pregnant to ensure that the radiation

exposure is as low as reasonably practical due to the cumulative effect. For example, one study assessing this reported that the radiation dose to the fetus can exceed a recommended dose limit of 1 mSv after 10 return trips on commercial flights between Toronto and Frankfurt.⁴ A further publication from the UK Department for Transport estimates that exposure at 39 000 feet in temperate latitudes is approximately 6 microSv/hr (twice the exposure at 26 000 feet), which would result in an exposure of just under 1 mSv in 160 hrs of flying.⁵

1.3 *Body scanners*

An issue that women increasingly ask about is the use of body scanners (back scatter machines and millimetre wave units) utilising ionising radiation for security checks prior to flying. The Department of Transport and Health Protection Agency in the UK published information and guidance on this in 2010.⁶ This guidance reports that the total radiation dose from an examination, which may involve two or three scans, is less than that received from 2 minutes flying at cruising altitude, or from one hour at ground level. With regard to pregnancy, this report notes that negligible radiation doses are absorbed into the body and therefore the fetal dose is much lower than the dose to a pregnant woman. This is consistent with the information from authorities in the USA which put the radiation exposure into context by noting that backscatter machines produce radiation exposure equivalent to 2 minutes of air travel, while millimetre wave units, those that provide 3-dimensional images, have emission levels 10 000 times lower than a mobile phone.⁷ This dose level is not considered a significant risk and therefore there is no information to suggest that a pregnant woman should avoid such security scans.

1.4 *Airline concerns*

The main concern restricting the airlines from accepting pregnant women as passengers relates to the risk of labour developing, which may disrupt or divert the flight and the lack of appropriate care providers and facilities to manage labour or any obstetric complication in flight. As the majority of pregnancies extend to at least 37 weeks of gestational age, many airlines do not allow women to fly after 36 completed weeks of gestation because of this risk. If there are significant risk factors for preterm labour, such as in multiple pregnancies, women should not fly after 32 completed weeks of gestation. In such women considered at risk of preterm birth it may be useful to seek specific expert advice on the risk of preterm labour before travelling. Many airlines will require a letter from a midwife or doctor confirming that there are no anticipated complications for flights taken after the 28th week of pregnancy and confirmation of the expected date of delivery.⁸

1.5 *Conditions that obstetricians should be aware of*

Therefore, although there is no specific risk to pregnancy associated with commercial air travel, it is important that the obstetrician is aware of conditions which may complicate the pregnancy and could lead to an increase in risk of problems. It will often be useful to consult specialist information for such conditions information such as that of the Aviation Health Unit's 'Guidance for Health Professionals'.⁹

Examples of relevant medical complications which may occur during pregnancy and which would contraindicate commercial air travel include:

- severe anaemia with haemoglobin less than 7.5 g/dl
- recent haemorrhage
- otitis media and sinusitis
- serious cardiac or respiratory disease
- recent sickling crisis
- recent gastrointestinal surgery, including laparoscopic surgery, where there have been gastrointestinal procedures carried out and where suture lines on the intestine could come under stress due to the reduction in pressure and gaseous expansion
- a fracture, where significant leg swelling can occur in flight, is particularly hazardous in the first few days of a cast being placed.

A particular concern is the risk of DVT. As noted earlier, pregnancy carries a significant risk of venous thrombosis. Although the absolute risk is small, this risk is likely to be increased by air travel owing to immobility, and sometimes cramped conditions for taller women. The true frequency of DVT during long-haul flights in pregnancy is unknown and difficult to determine, particularly as the condition may be asymptomatic. It is accepted that prolonged air travel results in a small increase in the absolute incidence of venous thromboembolism (VTE) of around three-fold,¹⁰ with an 18% higher risk of VTE for each 2 hour increase in flight duration. However, the overall absolute incidence of a symptomatic VTE is low, with a rate of 1 in 4600 flights in the month following a flight of 4 hours duration. Clearly the risk will vary according to the individual's risk factors for thrombosis. For example there is an increased incidence in those with thrombophilia and combined oral contraceptive users.¹⁰

In non-pregnant populations, it has been estimated that around 4–5% of those at high risk will develop symptoms of DVT associated with such travel.¹¹ To combat this risk, there is evidence that graduated elastic compression stockings worn during a flight will reduce the risk of asymptomatic DVT with a relative risk of 0.10 (95% CI 0.04–0.25).¹² This translates to an absolute risk in low-risk population of 4.5 fewer symptomatic DVT per 10 000, and in a high-risk population 16.2 fewer symptomatic DVT per 10 000 people. Although these data relate to the nonpregnant population, it may be reasonable to apply them to women who are pregnant.

2. Practical considerations and advice

For women with an uncomplicated pregnancy and no medical or obstetric risk factors for complications that would contraindicate air travel, there is no indication to give advice against commercial air travel. Specifically there is no issue with travel in early pregnancy as the main consideration is risk of labour. However, where the woman is at risk of miscarriage or ectopic pregnancy, such as where she has a previous ectopic pregnancy or history of recurrent miscarriage, it would be prudent to confirm the location and/or viability of the pregnancy by ultrasound prior to travel. Note that it is important to ensure that appropriate travel insurance that covers pregnancy is in place, including the costs of repatriation in the event of a serious problem.

When giving advice, consideration should be given not only to the woman's obstetric and medical condition and risk factors but also the reason for travel, the duration and the destination. Issues associated with destination include the recommended immunisation and antimalarial medication.⁸ In general terms women who are pregnant can use antimalarial agents. Vaccinating pregnant women with inactivated virus vaccines, bacterial vaccines or toxoids is considered safe. Live vaccines, such as yellow fever, should be avoided. Women should be advised to obtain up to date information from a specialist travel clinic regarding the need for, and safety of, vaccines relevant for the destination. Even at advanced gestation, there is no significant risk associated directly with flying and indeed air travel may be of significant value in obstetric emergencies.¹³ However, in view of the difficulties associated with labour occurring in flight, it would appear to be prudent to avoid air travel from 37 weeks of gestation in an uncomplicated singleton pregnancy and from 32 weeks of gestation in an uncomplicated multiple pregnancy. This is consistent with International Air Transport Association (IATA) recommendations, but note that there is still variation between airlines and the woman should check with the specific carrier before flying. For seat belt use, the woman should be advised to ensure that the strap is reasonably tightly fastened under her abdomen and across the top of her thighs.

With regard to minimising the risk of DVT, appropriate general advice would be to:

- have an aisle seat to facilitate ease of movement
- take regular walks around the cabin and/or;
- carry out in-seat exercises approximately every 30 minutes on a medium or long-haul flight
- maintain a good fluid intake and minimise caffeine and alcohol intake to avoid dehydration
- make a specific individualised risk assessment for thrombosis in pregnant women who are flying.

For short-haul journeys no specific measures are likely to be required. For medium to long-haul flights lasting more than 4 hours, it is suggested that all pregnant women are advised to wear properly fitted graduated elastic compression stockings. This is consistent with recent international guidance.¹⁰

Women may have additional risk factors for thrombosis such as a previous DVTs, symptomatic thrombophilia (such as antiphospholipid syndrome or DVT and a heritable thrombophilia), morbid obesity or medical problems such as nephrotic syndrome. For such women, specific pharmacological prophylaxis with low-molecular-weight heparin (LMWH) in the doses recommended for antenatal prophylaxis should be considered for the day of travel and several days thereafter, if the woman is not already on LMWH. The appropriate duration of such thromboprophylaxis is not established and is a matter for clinical judgement based on the perceived magnitude and duration of risk for the individual woman. Expert advice should be sought in relation to thromboprophylaxis when it is required. In many such cases, the woman is liable to be on antenatal thromboprophylaxis with LMWH¹⁴ in any event and this should be continued. She may require a letter to confirm the gestation and also for security purposes if she is carrying a supply of LMWH injections. It should be noted that aspirin alone is not recommended as VTE prophylaxis primarily because more effective methods of prophylaxis are readily available, and there is an association with potential nonobstetric haemorrhagic complications.⁹ Thus, the woman at high risk of VTE should be treated with LMWH as described above.

3. Opinion

There is no evidence that passenger air travel increases the risk of pregnancy complications such as preterm labour, rupture of membranes or abruption. The radiation dose to the fetus from flying is not significant unless frequent long-haul air travel occurs in pregnancy. Body scanners that utilise ionising radiation for security checks do not pose a risk to mother or fetus from radiation exposure. Flights of more than 4 hour duration are associated with a small increase in the relative risk of venous thrombosis, but overall the absolute risk is very small. The presence of specific risk factors for thrombosis would be expected to increase the risk and therefore a specific risk assessment should be made for thrombosis in pregnant women who are travelling by air. Specific measures that are likely to be of benefit are graduated elastic compression stockings for women who are pregnant and flying medium to long-haul flights lasting more than 4 hours, and LMWH for those with significant risk factors such as previous thrombosis or morbid obesity. Low dose aspirin should not be used in pregnancy for thromboprophylaxis associated with air travel.

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