Link Between Air Pollution and Deep Venous Thrombosis Risk

Baccarelli A, Martinelli I, Zanobetti A, et al. Exposure to particulate air pollution and risk of deep vein thrombosis. Arch Intern Med 2008;168:920–7.

Study Overview

Objective. To evaluate the impact of exposure to air pollution on the risk of developing deep vein thrombosis (DVT).

Design. Population-based, nested case-control study.

Setting and participants. Patients from the Lombardy region of northern Italy previously diagnosed with DVT were asked to recruit friends and nonblood relatives to serve as controls. All participants were interviewed about clinical history, lifestyle, and reproductive practices, with special interest in women currently using oral contraceptives or on hormone therapy. Participants were assigned to 1 of 9 geographic areas within the Lombardy region based on their residence. Mean concentrations of particulate air pollution of less than 10 μm in aerodynamic diameter (PM_{10}) were measured throughout 53 sites in the Lombardy region over 1 year.

Main outcome measures. Association between PM_{10} and prothrombin time (PT) and PM_{10} level and DVT risk.

Main results. 871 patients and 1210 controls participated in the study. For both groups, exposure to elevated PM_{10} for 1 year was consistently associated with increased risk of DVT (odds ratio [OR], 1.70 [95% confidence interval {CI}, 1.30–2.23]; P = 0.001). Women were generally less likely to be affected by particulate air pollution than men (OR, 1.40 [95% CI, 1.02–1.92]), and women taking oral contraceptives or hormone therapy had no ill effects related to particulate air exposure (OR, 0.97 [95% CI, 0.58–1.61). Exposure to PM_{10} was significantly associated with shortened PT for patients and controls.

Conclusion. Air pollution appears to have a deleterious impact on DVT risk.

Commentary

Clinicians are increasingly recognizing that environmental factors can have a profound impact on an individual's health. Recent evidence has convincingly demonstrated the negative effects of secondhand smoke on cardiovascular health [1] and air pollution on asthma [2]. These new associations can help clinicians identify high-risk patients and potentially explain previously ill-understood underlying causes of disease.

The study by Baccarelli et al provides a potential new explanation for the development of DVT, an extremely common, expensive disease with substantial morbidity and potential mortality. The study suggests that air pollution can raise the risk of DVT, thus helping clinicians identify a potential new risk factor and policy makers a new impetus to target air pollution. However, the critical limitations of the study warrant more data before either clinicians or policy makers can be sure of this link.

Finding "good" controls is one of the most important steps in adequately performing a case-control study. Good controls are usually randomly selected individuals who in most respects appear to have the same risk factors as the study patients except for the exposure of interest. However, this study used controls that were nonrandomly chosen by the study patients (usually family members or close friends). It is possible that study patients chose healthy family and friends to serve as controls instead of their frail relatives, which would potentially bias the study. Important baseline differences in education, body mass index, and other factors underscore this concern.

Another critical limitation is that air pollution was measured based on where participants lived. Although this might seem like a reasonable surrogate, understanding whether these patients actually had higher levels of causative factors on laboratory testing (eg, elevated cotinine levels for individuals who inhale secondhand smoke) would be extremely helpful in making the link more definitive. Finally, Lombardy is a highly industrialized region, and studying whether these effects would also be present in a city in the United States, where air pollution is likely to be from cars as opposed to industrial production, would be valuable.

Applications for Clinical Practice

This novel study by Baccarelli et al links air pollution to DVT risk. Although the limitations of the study make the results less than definitive, it clearly warrants more research and should alert clinicians to begin to consider air pollution as a possible risk factor for patients with DVT.

—Review by Ashish K. Jha, MD, MPH

References

1. Panagiotakos DB, Chrysohoou C, Pitsavos C, et al. The association between secondhand smoke and the risk of developing acute coronary syndromes, among non-smokers, under the presence of several cardiovascular risk factors: The CARDIO2000 case-control study. BMC Public Health 2002;2:9.
2. Riedl MA. The effect of air pollution on asthma and allergy. Curr Allergy Asthma Rep 2008;8:139–46.

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